THE

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OF

THE ASIATIC SOCIETY

OF

BENGAL.

VOL. II.

THE

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OF

THE ASIATIC SOCIETY

OF

BENGAL.

EDITED BY

JAMES PRINSEP, F. R. S.

SECRETARY OF THE ASIATIC SOCIETY.

VOL. II.

JANUARY TO DECEMBER,

1833.

"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science, in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta; it will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease."

SIR WM. JONES.

Calcutta:

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1833.

PREFACE.

On completion of this second volume of the Journal of the Asiatic Society, the Editor feels it to be due to his subscribers, as well as to himself, to lay before them as briefly as possible, the results of the arrangements which he contemplated carrying into effect at the conclusion of the last volume;—more especially as a somewhat erroneous estimate of the cost and circulation of the Journal found admission into a late notice of the Indian Periodical Press, drawn up by the Editor of one of the morning papers. The Journal is not published, as there stated, by the Asiatic Society, but solely at the cost and responsibility of the Secretary, who was Editor of it before he enjoyed the honour of an election to that office. Since there never has been the least view to profit, either in the Gleanings or in the present work, there can be no object whatever in concealing any information respecting its publication; and it may be useful hereafter to find on record a note of the expences of printing, and the difficulties against which a Journal exclusively scientific has had to contend, as well as the advantages which it has enjoyed, in India at the present time. The following particulars have therefore been extracted from the accounts of the two years now terminated.

The amount of subscriptions to the Journal at one rupee per number, including two extra numbers, in 1832, was .... Rs.		5148 8
From this, deducting 20 per cent. commission paid to Messrs. Thacker and Co. for circulating it, ...		1028 11
There remained net subscriptions available, Rs.		4114 13
The Baptist Mission Press charged for printing and stitching 500 copies, Rs.	3742 10	
And the 15 plates cost with printing,	416 5	
Total		4178 5

The result of the first year exhibits a sufficient accordance between outlay and return. Of the amount subscribed however, only Rs. 3786 13 have been collected up to the present time, so that in fact there was a deficit of Rs. 392 2.

The alterations which the Editor proposed and completed for the second year were :—

1. The saving of nearly half of the commission paid for the mere circulation of the work (without responsibility), by undertaking that duty with the aid of his establishment as Secretary of the Asiatic Society;

2. As a return for this favor, he proposed circulating the Journal gratis to such of the paying members as should express a desire to take it in.

The effect of this scheme has been as follows :

Fifty members of the Society have availed themselves of the privilege, which has made a deduction to the same amount from the monthly receipts. The number of copies circulated, including those sent to subscribers and societies in Europe, is about 450.

The number of paying subscribers on the list, is 320, which at 1 R. per month, (including one extra number of Buchanan,) would give Rs. 4480.

The expenses of printing 500 copies, of 670 pages,

at 4-5 per page, may be stated at	Rs.	2,890
144 pages of Buchanan, at 4-8 per page,.....		648
Covers, table work, &c. charged extra, ...		250
40 pages of Appendix, at 5 Rs.....		200
28 plates (18 lithographs, 10 engravings*), ...		480
Establishment for circulation, ...		600
	——	5,068

Leaving a loss on the year of Rs. 588, or nearly as much as the subscriptions of the members exempted from paying.

But it must be mentioned, and mentioned with a degree of disappointment which is almost disheartening, that of the flattering list of sub-

* For these the cost of printing and paper only is charged.

scribers above given, 70 have not paid any part of the year's subscription, and as many more are still in arrears; so that a balance of Rs. 1321-8 still remains to be collected. The actual state of the concern is therefore by no means so favorable as could be wished, for it leaves the Editor out of pocket upwards of 2000 Rs. as the reward of his labour for two years ! B əɥ ɹnwill not for a moment suppose that the balances outstanding are not recoverable: on the contrary the principal difficulty lies in the distance, and the supposed want of a mode of remittance.—Many subscribers are not aware, that letters containing hoondees for the amount may be transmitted *post free* to the Editor.

It will be remembered, that the Bengal Government were pleased to bestow the privilege of free postage on the GLEANINGS and on the JOURNAL, on condition of the publication of the late Dr. Buchanan's Statistical Reports. Under the impression (justly formed) of a corresponding increase of circulation, consequent upon this liberal boon, it was resolved not to incorporate these records in detached notices in the JOURNAL, nor to diminish from its original matter*, but to publish them as a separate work; and one volume has accordingly been completed, containing 356 pages, which at 4·8 per page have cost Rs. 1,602

And a reprint of the first 108 pages, which became necessary on the subsequent extension of the edition from 300 to 500 copies, 216

Total, Rs. 1818

This expence has been incurred therefore on account of Government, in return for the postage saved, not to the work, but to the subscribers of the JOURNAL. On the completion of the first volume of BUCHANAN, a second extra volume of an official nature on the Monetary System was commenced, of which 50 pages have been printed with 3 plates, being in fact an expence of more than 300 rupees not included in the above estimate. The Government meantime placed the remaining volumes of Buchanan in the Editor's hands, with an intimation of its "desire that the printing of these records should be continued." It was therefore with no small feeling of mortification that

* Originally 32 pages only were given in each number, latterly 64.

the EDITOR perused the following letter, announcing that the privilege of free postage should cease from June next, especially after having been honored, on an explanation of the nature of the work, with an extension of the same privilege to the Madras presidency, in addition to that formerly bestowed by the Governors of Bombay and Ceylon.

To JAMES PRINSEP, Esq.
Editor of the Journal of the Asiatic Society,

Genl. Dept.

Sir,

I am directed to inform you, that the Governor General in Council has resolved, that after six months the exemption from postage, which is now enjoyed by the Journal of the Asiatic Society, shall be discontinued.

I have the honor to be,
Sir,
Your most obedient servant,
G. A. BUSHBY,
Offg. Sec. to Govt.

Council Chamber,
2nd Dec. 1833.

It may reasonably be feared that many subscribers at distant stations may be unable to continue their support to the work, when its cost shall be enhanced by postage; but (should it be impossible, on a proper and respectful representation of the circumstances, to avert the imposition of postage) every means will be taken of lessening the burthen by sending the monthly numbers by the bangy instead of the regular dâk.

On the contents of a volume which has already been perused by nearly all to whom it circulates, it would have been obviously needless to make any remark, were it not desirable to prove that the favors hitherto conferred upon the work by the Government of the country had not been altogether misapplied.

Independently of the volume of Dinajpur Statistics, which forms a model for the use of public officers engaged in collecting similar information, the GLEANINGS and the JOURNAL have been the means of bringing to notice many of the mineral resources of our vast Indian Empire, and of leading to fresh discoveries by the announcement of what had already been found: coal may be adduced as an example,—of which twenty or more different localities have been brought to our knowledge through its pages, where only two were before known. Of the native mineral productions, iron, copper, gold, &c.:—Of the native arts and manufactures, salt, nitre, turpentine, dyes, mills, &c. numerous original ac-

counts have been inserted : catalogues of woods, medicinal plants and drugs : experiments on materials, wood, iron, cement ;—Statistical reports ;—descriptions of newly explored countries and people :—in fact, it would be difficult to open a number of the JOURNAL without finding some information which must possess value in the eyes of a government. Contributions of a more exclusively scientific nature have, in the mean time, continued to multiply, and the objects pointed out as desiderata at home in the geography, meteorology, geology, and natural history of this country, are in the course of rapid and systematic elucidation. So numerous for instance have been the registers of the weather offered for publication, that space could only be found for abstracts of many. There has hardly been time for the collection of materials regarding the tides of the Indian coasts, suggested in the Rev. Professor WHEWELL's circular, (inserted in page 151,) but the attention of those who have opportunities of eliciting the information required, is again solicited to this object.

As a proof of the benefit conferred on science by the free and extensive circulation of a periodical devoted to such objects, the Editor feels pride in alluding to the ardour which his plates of ancient coins have inspired in many active collectors, and above all to the reward bestowed on himself by the munificence of General VENTURA, the most successful pursuer of antiquarian research in the Panjáb, who has presented to him all the coins and relics discovered on opening the celebrated Tope of Manikyala. They are now on their way to Calcutta.

That extracts and analyses of European science have not been more frequent must be attributed once more to want of space and want of leisure. The Editor would recommend all who seek for knowledge of the progress of science in Europe to procure a copy of the Reports of the British Association for 1832, in which they will find every branch discussed by the philosopher best able to give it illustration. To attempt to shorten those admirable essays would be mutilation rather than abridgment ; yet unfortunately most of them are too long for the pages of a monthly journal.

On the subject of orthography of native words, the Editor is driven to make one concession, for which he fears the learned Societies at home

will denounce him as an apostate to the system of their leader. Every communication, with hardly any exception, which comes for publication, adopts the Gilchristian mode of spelling, or that modification of it which has been *ordered* to be used in all Government records, surveys, &c. An attempt has been made hitherto to conform the whole to Sir William Jones' method, but necessarily there have been continual omissions, and the contributors in most cases express themselves but ill pleased to see their words transformed into shapes but ill accordant with ordinary *English* pronunciation. The Editor has therefore resolved to adopt the middle course followed in Hamilton's Hindustan, namely, to print all Indian names and words in the ordinary roman type as they are usually written and pronounced, and to place in italics all such native terms and proper names, as are corrected, and spelt according to the classical standard of Sir William Jones : in many cases the latter may be inserted in brackets after the ordinary word.

Where contributors have occasion to illustrate their papers by plates, it will be a great convenience to the Editor to have the original drawings prepared of the same dimensions as the printed page of letter press, to save the trouble and expence of reducing them.

The Editor will not allude in this place to the severe loss he has sustained in the death of some of the most able and constant supporters of his work, and the departure to Europe of others in the course of the past year; since he hopes that a more worthy channel will be found for the record of their meritorious labours for the cause of Science in India, in the Proceedings of the Asiatic Society, to which their names belong, and in which their reputation must ever be cherished with fond remembrance.

1*st January*, 1834.

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No. 19.—*July*, 1833.

I.—THE BIRTH OF UMÁ—A LEGEND OF HIMÁLAYA,

By Cálidása,

(being the first Canto of his great poem the Cumára-sambhava).

The Sanscrit text translated into corresponding English measure, with notes and illustrations.

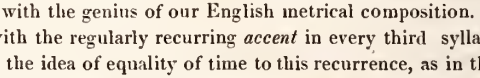
ARGUMENT.

Nature and site of Himálaya, (1.) *His pre-eminence among mountains, how shown,* (2.) *Not disparaged by frost,* (3.) *Description of his sublime appearance and various wonders,* (4—16.) *His designation as King of Mountains by* Brahma, (17.) *His marriage with the nymph* Ména, (18.) *Birth and description of their first-born son, the mountain* Maináca, (19, 20.) *New birth, from the same pair, of* Satí, *once daughter of* Daxa *and wife of* Siva, (21, 22, 23.) *Appearance and growth of the beautiful daughter thus born anew,* (24, 25.) *Her designation as* Párvatí *and as* Umá, (26.) *Prized above all things by her father* Himálaya, (27, 28.) *Her childhood and education,* (29, 30.) *Her more mature youth,* (31, 32.) *Description of her person,* (33—50.) *Her destiny as future wife, the second time, of* Siva, *made known to her father,* (51, 52, 53.) Siva, *after long mourning for* Satí, *comes to Himálaya to perform austerities,* (54, 55.) *His troop of attendant Gods described,* (56,) *and his Bull,* (57.) Siva *then commencing his austerities,* (58,) *is worshipped by* Himálaya, (59,) *and at his command by his daughter* Párvatí; *whose influence on* Siva, *together with* Siva's *influence on her, are described,* (60, 61.)

The lines marked * thus in the first five stanzas are those which *exactly* represent in structure the *pádas* or quarters of stanzas in the original—consisting of an Iambus or Spondee, a Bacchius, an Anapæst and Bacchius ; thus,

⏑ — ⏑ — — ⏑⏑ — ⏑ — —

This hendecasyllable measure, called by the Hindus इन्द्रवज्र or *Indra's thunderbolt*, (probably, because in one of the Brahmanas of the Sáma Véda, Indra is said to have aimed his thunder at the demon Vritra by means of Sanscrit metres!) extends through the whole of this canto, with the exception of the last stanza, the 61st: and is next to the *Anustup* or ordinary loose Iambic, the most frequently used, beside being one of the most harmonious, measures of Sanscrit poetry. In its application to the less measured structure of English syllables, its rhythmical effect is perhaps better represented by the following musical notation, than by any terms of prosody: (the semiquavers denoting the rapid or short syllables, and the quaver and all beyond, without distinction, denoting the long :)



a notation which may also serve to shew the reason why the *rigorously exact* imitation of this, as of other measures belonging to classical ancient languages, is not accordant with the genius of our English metrical composition. The Teutonic ear, content with the regularly recurring *accent* in every third syllable, and insensibly attaching the idea of equality of time to this recurrence, as in the musical bars above written, does not acknowledge any law that should thus *perpetually* and *invariably* distinguish the middle bar, by a dactylic subdivision, from the amphimacer of the bars preceding and following it: but allows, and even requires, for variety's sake, the mutual interchange of these different modes of subdivision, in the several repeated periods of the same rhythm. Such is the case with more or less variation in all the lines not marked with a star in the first four stanzas: and the plentiful intermixture of such lines is therefore more a matter of taste, to avoid what would be in English an intolerable uniformity, than a sacrifice to the mere ease of versification.

It is far different with the ancient languages of Greece and Rome ; which in the regulation of metre by *quantity* exclusively of *accent* exactly resemble the Sanscrit. In all these, the conception of time being adjusted rigorously to that standard of quantity, which counts two short syllables (or *Mátrás* in Sanscrit) equivalent to one long, the substitution in any lyric measure of dactyl for amphimacer, or anapæst for bacchius, is known to be impossible. Adopting therefore their standard, the most perfect conception may be attained by a classical scholar of our present Indian measure, by joining an *Alcaic* commencement to a *Sapphic* termination. Thus if in the first of the Alcaic odes of Horace, we transpose or slightly interpolate the ends of its two first lines, the middle of its third, and the beginning of its fourth, thus—we make the complete *Indra-vajra* stanza.

Vides ut altâ *nive candidum stet*
Soracte, nec *sustineant onus jam*
Silvæ labore *exanimes*, geluque
En, flumina *ut* constiterint acuto.

Or if we take the 22nd ode, which is in the Sapphic measure, a yet slighter alteration will suffice to give each line the Alcaic commencement necessary to make the same Indian metre ; thus,

1.

* In regions far North, clad in deiform might,
The Mountain King rises, HIMÁLAYA hight:
* Whose giant form, stretching along in one sweep
* From th' Eastern main forth to the Westernmost deep,
Might seem, as it join'd them, the measuring rod
* Laid o'er the broad earth by its architect God.

Vitæ integer qui, scelerisque purus,
Non *ille* Mauri jaculis neque arcu,
Nec *felle tinctis* gravidâ sagittis,
Mi Fusce, *securus eget* pharetrâ.

Though this particular species of double dochmiac measure does not itself occur in Horace or in Pindar, it may be found sometimes in the choral strains of the Greek tragic poets—but in insulated lines only. Thus in the Persæ of Æschylus, the 5th strophe and antistrophe of the last choral song of lamentation contain the following regular *Indra-vajra* lines.

Stroph. Τί δ' οὔκ; ὄλωλεν μεγάλως τὰ Περσᾶν [v. 999.]
Antistr. Τραπέντα ναύφρακτον ἐρῆις ὅμιλον [v. 1009.]

(each being followed by two lines in the kindred Indian measure called वंशस्थविलं)

The following commencement of a similar strain in the Antigone of Sophocles, (uttered by the unfortunate heroine herself,) is in the same measure:

Stroph. Ορᾶτε μ'ω γᾶς πατριᾶς πολῖται [v. 817.]
Antistr. Ἤκουσα δὴ λυγροτάταν ὀλέσθαι [v. 834.]

(in which we may also observe, no less than in the Alcaic, another peculiarity of our Indian measure, the *commonness* of the first syllable).

So is the commencement of a similar strain in vv. 431 and 439 of the Medea of Euripides, (p. 39, ed. Porson)—and the concluding line of another in vv. 763,771 of the Supplices of Æschylus, (p. 35,36, ed. Scholfield)—and others which it were needless to transcribe.

St. 1. *the measuring rod*
Laid o'er the broad earth by its architect God.

The words "*by its architect God*" are an addition to the expressions of the original, but not to the sense, even according to Hindu ideas: the earth's "measuring rod" presupposing a builder, viz. the creator Brahma. When we consider the Himálaya, in the words of the Baron de St. Croix, as a part of one "great chain of mountains which rising on the sides of Lycia, Pamphylia, and Cilicia, stretch across Asia from West to East, and after receiving the different names of Taurus, Paropamisus, Imaus, and Emodus, terminate at the sea that washes China," and thus join, as our poet declares, both oceans,—the comparison of the vast progressive range to such a rod, will scarcely be thought an unhappy one. But bating this, which is peculiar to our Indian author,—the image of an artificer, and even of an instrument of measurement, is not thought unworthy to represent the Supreme Being, and his absolute control of the most stupendous objects of the visible creation, in the pure theology of our inspired Scriptures. See Isaiah xi. 12, 15, &c. but I would particularly refer to two remarkable instances in the book of Job (xxviii. 25, and xxxviii. 3, 4): in the former of which the Hebræo-Arabic word מדה (مدّ) applied to the

2.

Him once the gay hills, so they tell, all agreed
* To make the prime Calf of their glorious high breed ;
And MÉRU himself, skill'd in milking of yore,
Stood milker for all of the genial Earth's store :

---

measurement of the great waters, exactly answers in meaning to our Sanscrit मानं —as its derivative מדד (ܡܕܕ) in the latter, which I now quote, might both from its form and its parallelism with the *cord* in the 4th line, be almost conceived to be synonymous with our मानदण्डः (the word not occurring elsewhere in Scripture.)

איפה היית ביסדי—ארץ Where wast thou, when I laid the foundations of the earth ?

הגד אם ידעת בינה Tell, if thou art acquainted with knowledge.

מי—שם ממדיה כי תדע Who disposed the dimensions (or dimensors ?) of it if thou knowest ?

או מי—נטה עליה קו Or who stretched over it the measuring line ?

St. 2. *Him once the gay hills, &c.*—The truly Indian legend of this verse is contained with somewhat more particularity in the 6th chapter of the Hari-Vansa, the last book of Vyása's sacred epic, the Mahábhárata.

शैलेषु श्रूयते राजन् पुनर्दग्धा वसुन्धरा ।
ओषधीश्च मूर्त्तिमतीरत्नानि विविधानि च ॥ ३९ ॥
वत्सस्तु हिमवानासीन्मेरुर्दोग्धा न संशयः ।
पात्रं तु शैलमेवासीत्तेन शैला विवर्द्धिताः ॥ ४० ॥

And also in the 18th chapter of the 4th book or Skandha of a more recent mythological authority, the Bhagavat Purána.

वटवत्साश्च तरवः पृथग्रसमयं पयः ।
गिरयो हिमवद्दत्सा नानाधातून् स्वसानुषु ॥ २४ ॥

But the legend which has given to both these chapters of the Hari-Vansa and the Bhagavat respectively the title of *Prithvi-dóha*, or " the milking of the earth," is not confined to the subject of these lines, i. e. to the Mountains and their chosen Calf Himálaya. The injunction of PRITHU to his obedient wife (or as some authorities have it, his daughter) PRITHVI, i. e. the Earth, extends to the suckling of all orders of the creation, from the ultra deified saints or Rishis down to the trees of the forest : each of which, according to the high authority first quoted, were desirous of the favour, and had its own Calf, its milker, and its appropriate milk or nutriment, drawn by him from the udder of Mother Earth in an appropriate pail. The fable is sufficiently curious and illustrative of Indian mythology in general, to be stated at greater length.

The Rishis chose for their prime calf, Soma, regent of the moon : and the sage Vrihaspati, son of Angiras, acting as milker for the rest, drew the pure milk of *austere and spiritual science* from the earth's breast into a pail composed of the metrical Vedas.—The celestial Gods chose Indra for their calf : and their milker Surya, or the Sun, milked the earth of *strength* in a pail of gold.—The Pitris or Dii Manes having chosen Yama (the Indian Pluto), for their calf, their milker, Fatal Time, drew from the earth's bowels the *sacred food offered to deceased ancestors*, into a pail of silver.—The Nágas or serpentine deities of the

Who, heeding their wish, at great PRITHU's behest
* Gave freely, cow-like, of her swelling dark breast :
* And sparkling bright gems, with all healing herbs' power,
Gush'd out for this dear mountain-babe to devour.

---

realms below, having chosen Taxaka as their calf, and Dhritarástra as their milker, milked the earth of its *poisons* in a gourd pail.—The Asuras or malignant deities, choosing Viróchana, son of Prahlada, as their calf, and Madhu for their milker, milked the earth of *illusion* in a pail of iron.—The Yaxa demons, choosing Cuvéra (the Indian Plutus or Mammon) for their calf, (the milker not named,) milked the earth of *dissimulation* in an earthen pail.—The several descriptions of fiends and vampires, the Raxasas, Pisáchas, Bhútas, &c. all choosing Sumali for their calf, and Rajatanabha, (the silver-naveled goblin,) for their milker, drew *blood* from the teats of the earth, into a dead man's scull used for a pail.—The Gandharvas and Apsaras, the songsters and dancers of Paradise, choosing Chitraratha for their calf, and Vasaruchi for their milker, drew *perfumes* from the earth's bosom into a lotus pail.—The mountains having chosen, as we have seen, Himálaya as their calf, and Méru for their milker, milked the earth of *jewels* and *rich herbs* in a pail of stone.—Lastly, the trees, having chosen the Plaxa or holy fig-tree for their calf, and the Sál tree for their milker, drew *buds* from the earth's bosom in a leafy pail.—So far the Mahábhárata : with which the Bhagavat disagrees in several minor particulars : both of these grave authorities, however, agreeing with each other, as I am happy to observe, in fully confirming the statement of our poet in this verse respecting his mountain King.

The Scholiast Nílakantha on the Mahábhárata makes the principal herb of which the Earth was milked for Himálaya, to be the ज्योतिष्मती or *luminous plant*, whether fabulously so called or otherwise, of which we shall have occasion to speak more particularly on the 10th stanza. But the commentators on Cálidása, both Mallinátha and Bharata-mallica ; assign that place to the fabled *Sanjívaní* whose juice can revive the dead : the latter adding also the herb *Visalya-karini*, to which the same revivifying property is ascribed in the Lanka-kandu or 6th book of the Rámáyana of Valmíki. The idea of medicinal herbs is therefore made the most prominent in my translation : though it should be added that both the above-mentioned Scholiasts apply the epithet भास्वन्ति here, viz. "*sparkling*" or "luminous," to the "*herbs*," as well as to the "*gems*."

The all-sustaining virtues of Mother Earth could not possibly be conveyed to a Hindu under a more dignified image than that of a cow and her dependent calves. We see the same image curiously applied to the highest mysteries of the Vedantic philosophy, in the following distich of the *Panchadasí* or Quindecad of Vidyáránya Svámí,

मायाख्यायाः कामधेनोर्वत्सौ जीवेश्वरावुभौ।
यथेच्छं पिबतो द्वैतं तत्वं त्वद्वैतमेव हि ॥

i. e. "Of the cow of desire, called MA'YA' (the Great Illusive Mother of Nature, of whom Satí and Parvatí are but incarnations), there are two calves,—the separate SOUL, and GOD. Both drink abundantly as they list : (the former drinks) *duality* (or diversity), which is its essence ; (the latter,) *simple unity*."

Compare the cow Nandiní in the *Raghu Vansa* of our author, II. 63—66, &c. &c.

3.

While gems thus unnumber'd of bountiful Earth
Encompass this favourite child from his birth,
* Ev'n hoary dull frost, on his lofty brow seen,
Takes nought from his bliss or his glory, I ween:
* One fault may well merge in a flood of such praise,
* Unmark'd, as one spot in the gentle Moon's rays.

4.

For borne on his craigs, lo what rivals the grace
* Of fairy light steps that ethereal nymphs trace,
* The glitt'ring bright rock, all in broken streaks seen
As belts of the shifting cloud gather between;
* And evermore wearing, from morn to still night,
The rich blended hues of the ev'ning twilight.

St. 3. *Ev'n hoary dull frost, &c.*—This idea of frost, as a mere blemish in the otherwise surpassing glory of the mountain, is characteristic of Hindu sentiment. Thus in a curious dialogue called *Vishva-gunádarsana*, written by an ingenious poet of the Deccan, named Venkatichári, describing the travels of two Gandharvas or celestial songsters over the world, one of whom praises, the other censures, every thing,—the praise of Badarika, the holy retreat of the sage Vyása on Himálaya, by the one, is reckoned to be sufficiently censured by the other urging the *frost*, which he declares sufficient to prevent, if not destroy the merit of every pious exercise performed there.

यद्त्र जागर्त्ति शिलासमं हिमं
सुशीतला गन्धवहास्य दुःसहाः।
जलावगाहाचकिता जनस्ततः
कुतस्त्वनुस्थास्यति कर्म निर्मलं।

Ibid. As one spot in the gentle moon's rays.—इन्दोःकिरणेष्विवाङ्कः The propriety of this expression is disputed by some Pandits, on the ground of the spot belonging not to the *rays* but to the *body* of the moon. Of this the reader may judge according to his taste.

St. 4. *The glitt'ring bright rock.*—The word धातुमत्ता or *mineral*, which I have translated *rock*, is explained by Bharata-mallica to mean here simply गरिकं or *red chalk*—by Mallinátha, a little more generally (धातवःसिन्दूरगैरिकाद्योयस्य सन्तीति धातुमान्), but still restricting the mineral or rocky strata here described to those of a red colour. Whence arises this determination of the Pandit commentators to give this special import to a word of general signification,—when the most various colouring which the word admits would both accord better with the actual appearance of the mountain, and add more grace to the author's description,—it is not easy to point out. I should be disposed to ascribe it to the comparison of evening twilight in this stanza, and the scholiasts' passion for systematizing the *loci communes* of poetry, evinced in making the evening hue exclusively red:—did I not observe the same limited interpretation elsewhere, as in v. 104 of the *Mégha Duta* of our poet—where their interpretation of

5.

* His tow'ring peaks, glowing with nearer sun's heat,
Are climb'd by the holiest devotees' feet;
Who worshipping first the huge shades, downward thrown
From clouds thickly circling the high mountain-zone,
Thence higher advancing, are chill'd in its rain
Of drenching white mist, ere the summit they gain.

6.

His snows soon effacing the marks, gory red,
Where lions, fierce slayers of elephants, tread;—

धातुरागाः or *colours* of the mountain rock, to be merely red, (notwithstanding the plural) is suspected by Mr. Wilson to be owing to the possible predominance of ammonite or copper ore in some of the strata of the Himálaya. I cannot however persuade myself that either in the present passage, or in that of the Cloud Messenger, Cálidása should have entertained the limited sense ascribed to him by his commentators,—since he has himself in another part of that poem (St. 60, 61, vv. 403—410 of Wilson's translation) described expressly in powerful images, though still below the truth of nature, the mingled white, blue, grey, and black, of the rocky strata of the same stupendous mountain to which his Yaxa hero was there exiled. The reader may, if he will, compare our ancient poet's description in these several places with what Mr. Fraser records in his Journal of a Tour to the Himálaya mountains (pp. 255, 317, 344, &c. &c. of the 4to. edition of 1820), respecting the intermixture of *every* diversity of hue, reflected from the variously stratified peaks. On every account, therefore, I prefer the most general meaning of the *dhátumattá* here.

Ibid. And evermore wearing, &c.—The meaning of these two last lines is conveyed by Cálidása in as many words, *Akála-sandhyám iva*, literally "like an evening-twilight out of its time:" but the immediately understood import of the short Sanscrit compound could scarcely be evolved intelligibly in a less compass of English words, than in the metrical paraphrase I have given.

St. 5, 6. My Malayalim MS. transposes these two stanzas: but the order of all the Devanágari and Bengáli MSS. and commentators, seems here decidedly preferable.

St. 5. *The holiest devotees.*—To the reports brought back by these holy pilgrims, (सिद्धाः or *perfect men*, as they are here called, when they attain their object,) a large portion of the strange matters popularly credited and described by our bard as belonging to this mountain, may be certainly ascribed: amongst them, the elevation above the region of frost and snow, of summits glowing with the more ardent heat of the approximated sun. See the note on St. 16.

St. 6. *The mountaineers, &c.*—Properly the KIRA'TAS: for the name, though often used to denote merely a mountain woodsman and hunter, was originally the name of a tribe or nation on the N. W. of the Indian mountains, viz. the *Kirrhadæ* (Κιρράδαι) of Ptolemy, or as it has been sometimes read *Kirrhodeeis*. In the Institutes of Manu (x. 43, 44,) these are enumerated along with some tribes of an undoubtedly Hindu origin, and others as undoubtedly foreign, (the Cambojas, the

The mountaineers, skill'd in the dangerous chase,
Can still, though unseen, the destroyer's path trace ;
The frontal pearls, dropt from his claws on the way,
Point out where the monster has borne his huge prey.

Yavanas or Greeks, the Sacæ or great Indo-Scythian nation, the Persians, Parthians, Chinese, the Daradæ, and inhabitants of Khasa-giri, or Cashgír, the Indian Caucasus,) who are said to have fallen to the lowest class from their original distinction of Xatriyas or Rajpútas, by neglecting the proper religious rites of their caste, and seeing no Brahmans.

शनकैस्तु क्रियालोपादिमाः क्षत्रियजातयः ।
वृषलत्वं गता लोके ब्राह्मणादर्शनेन च । ४३ ।
पौण्ड्रकाश्चौड्रद्रविडाः काम्बोजा यवनाः शकाः
पारदाः पह्लवाश्चीनाः किराता दरदाः खशाः । ४४ ।

The historical drama *Mudra-Ráxasa* enumerates the Kirátas together with the Sacæ, the Macedonian Greeks, the Cambojas, the Persians, and Bactrians, as having inundated from the N. W. frontier, under the conduct of Chánakya, Chandra-gupta's able and wily minister, the ancient capital of the Nanda kings ; शकयवनकिरातकाम्बोजपारशीकबाह्लीकप्रभृतिभिश्चाणक्यमतिपरिग्रहीतैश्चन्द्रगुप्तपर्वतेश्वरबलैरुदधिभिरिव प्रलयकालचलितसलिलसंचयैः समन्तादुपरुद्धं कुसुमपुरं । Act II. p. 41, ed. Wils. The note of the learned translator (p. 64, of the 3rd volume of his Hindu Theatre) here well deserves to be consulted. I would only add, with reference to two statements in it, that as the name יון *Yavan* or یون (Ιαονες), which is known to have been the common appellation of the Greeks throughout western Asia, leaves no doubt of the Yavanas here being the followers of Alexander the Great,—so there is as little reason for ascribing a vague or uncertain site to the Kirátas or Cirrhadæ. The most accurate of ancient geographers, by whom alone the name in this correct form was given to the western world, has in the 12th chapter of his 6th book, fixed with singular precision the position of these mountaineers with respect to the other Sogdian tribes, viz. on the eastern side of the Oxus, not far from its source in the Paropamisian mountains, near where their range meets that of the Indian Caucasus ; and not far from where Alexander fixed the site of the last of the cities called by his name, before he invaded India. Thus the Kirátas are north of the Bactrian tribes, and due west of the Sacæ, in the parallel of about 37° N. agreeably to what might be inferred from the Indian history preserved in the *Mudra-Ráxasa*. [The existence of a country called Cirrhadia, east of the Delta of the Ganges, the modern kingdom of Arracan, might lead to some confusion : but in the position of the *tribe* of Cirrhadæ by Ptolemy, there is no ambiguity : and his error in making the latitude of this and the circumjacent places too far north by about 4° is no impeachment of the accuracy of his *relative* description, obtained from the routes of the mercantile travellers of his day.] I will only add, that these same Kirátas seem laid down under the name of CIRABÆ INDI along the Imaus range towards the north, in that curious monument of antiquity, the Peutingerian Map [Sect. vii., *a Paralocis* (परलोकेभ्यः ?) *Scythis usque ad finem Asiæ.*]

7.

On him grow the birches, all rough with flak'd bark,
Which wanton wild elephants eagerly mark,
Their huge sweating fronts rubbing o'er it amain,
Till all its peel'd folds bear the ruddy deep stain :
That bark which hereafter, in paper's smooth leaves,
From min'ral red ink the trac'd letter receives ;
Impassion'd warm lines, haply, destin'd to bear,
By Love's god indited, to deified fair.

St. 6, 7. The frontal pearls, &c. &c.—The European reader has no need to be assured that the मुक्ताफलं or pearl, supposed here, and in numberless other Hindú writings to lie under the *kumbha* or frontal bone of the elephant, is a mere fabulous non-entity. The confidence with which book-learned Pandits will, however, assert its reality, is as surprising as it is characteristic : though some few, who have learned a little regard for experiment as a guide to truth, are cautious enough to confine its existence to the three former ages : thus making the frontal pearl (like the horse and ox sacrifice, perfect abandonment of the world, the presentation of flesh to deceased ancestors, and the levirate law), a thing too precious for the present degenerate Kali-Yuga or iron age of the world.

The same fabulous character is by no means so apparent in the *fragrant unctuous red ichor* mentioned in St. 7, as secreted in the elephant's forehead, and exuding during the rutting season. This persuasion, which not only pervades the literature of the Hindús, but has been communicated by them to inquirers of other nations, is however generally condemned by naturalists as a vulgar error ; the most diligent observers having failed to discover anything beyond common perspiration. (See Encycl. Metrop. Art. ELEPHANT : where is also stated a singular current belief, connected with this, of some natives of Western India.) Of the antiquity of this belief we have a singular vestige in Strabo's description of India, (lib. xv. vol. 6, p. 91, ed. Siebenkees) where he states that the male elephant at that season grows furious, and "emits a sort of fat through a pore or vent which he has near the temples :" the opening of the same pore indicating the corresponding season of the female. [*καίρος δ'ἐστι τῷ μεν ἄῤῥενι, ἐπειδὰν οἴκοι κατέχηται καὶ ἀγριαίνη. τότε δὴ καὶ λίπους τι διὰ τῆς ἀναπνοῆς ἀνίησιν ἣν ἔχει παρὰ τοὺς κρόταφους. ταὶς δε θηλείαις ὁταν ὁ αὐτὸς πόρος οὗτος ἀνεωγὼς τυγχάνη.*] This information was probably delivered by the Brahmans of Chandragupta's court at Pataliputra to Seleucus's ambassador Megasthenes, who is Strabo's great authority on Indian affairs : for Aristotle, who wrote shortly before that communication with India, and has embodied all the information of his time, (refuting whatever he thought fabulous,) in his numerous books on Animals, has recorded no such particular as this of the elephant.

Ibid. The भूर्ज्ज *Bhúrja* or *Mountain Birch*, (Betala Bhojapatra of Wallich,) is surrounded, like the birch tree of Europe, with a bark consisting of several layers, capable of being peeled off in ample flakes, and liable to become rough from the constant unequal peeling of its folds, though the texture of each layer or cuticle in itself is remarkably smooth : hence it is described in St. 57 of this canto as स्पर्शवती or pleasant to the touch, and thus a fit clothing for Siva's attendant gods. Though

8.

He, filling the hollows of all his brave trees
Of rattling bamboo with a whistling wild breeze,
That sounds from the covert of every deep den,
And echoes through all, over forest and glen,—
Might seem to be piping and leading along
Heaven's quire of musicians, commencing their song.

9.

His beauteous tall pines, when the elephants heal
By friction on them, the sharp twitching they feel

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this use of clothing the immortals is as little apparent in the present day as that of corresponding with them, the bark is still extensively employed, as it was in Cálidása's time, for the fabrication of a very common kind of paper among the Hindus, as well as for the less poetical purpose of supplying what our countrymen in India call the *snakes* of their hookas. A fuller description of this tree may be seen in Dr. Wallich's very valuable work, Plantæ Asiaticæ Rariores : to whom I am also indebted for a sight of a frustum of its trunk brought by him from Nipál, and illustrating the above statement.

The use of this birch paper in bearing erotic messages to the fair Vidyádharás of Indra's heaven, which Cálidása thus oddly contrasts with the rough embrace of the wanton elephants, (the two states of the bark being singularly mixed together in the Sanscrit sentence) is curiously illustrated by the converse application, exhibited by our poet himself in his beautiful drama of *Vikrama* and *Urvasí*, or the " Hero and the Nymph :" where the celestial nymph Urvasí uses a *leaf* of the birch tree to convey her passion to a mortal prince. The leaf plucked in the forest, and hastily inscribed with a few elegant Prácrit lines, is dropped by the divine fair one in sight of the king's confident, who bears it to his master. (Act. II, p. 33 of the Sanscrit edition, p. 86 of Wilson's translation.)

St. 8. *He filling the hollows, &c.*—The office ascribed to the sylvan and mountain deity Pan in the Homeric hymn to that god, and in Ovid's Metamorphoses, i. v. 707, of giving the first notions of music to mankind by blowing through reeds with the winds of heaven, and even instructing the immortals in the same art, (and as the Orphic hymn pursues the idea, thus setting an example of the harmony of the heavens,—

Ἐλθέ μάκαρ, σκιρτητά, περίδρομε, σύνθρονος ὥραις,
Αἰγομελές, βακχευτά, φιλένθεος, ἀντρωδίαιτε,
Ἁρμονίην κόσμοιο κρέκων φιλοπαίγμονι μολπῇ.

i. e. as some say, by the gamut of his syrinx answering to the seven planets,) is here ascribed to the gigantic Himálaya, with all the advantage that the far larger and more noisy reeds of the Indian forest give to the representation. Our poet has spoken elsewhere of the natural music of the bamboos, but in a more tranquil strain, and with no mention of the mountain leader of the band, or of his echoing caverns, in St. 58 of the Cloud Messenger, and in the *Raghu-vansa*, 2nd Canto, St. 12.

St. 9. *His beauteous tall pines, &c.*—The सरल Sarala or Pinus longifolia, sometimes called the Cheer, which is the species of pine here mentioned, is of the most

Athwart their big foreheads,—a liquor distil
Of milky white hue o'er each fir-covered hill :
Whose well diffus'd fragrance makes every dark height
And table-land, pregnant with od'rous delight.

10.

All night on his herbs as innocuous fires blaze,
The caves' inmost chambers are pierc'd by their rays :
Not trimm'd with oil they,—yet to spirits that rove
In forests, enamour'd, the true lamps of love.

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frequent occurrence in Sanscrit poetry. It grows in abundance, as I am assured by my learned friend Dr. Wallich, in Nipal, and all the mountainous regions on the northern frontier, and contains much resinous matter, of a very fine and aromatic kind ; which might not unreasonably be supposed to flow abundantly from any wound or incision made in the tree : but as to the scratching elephants habitually performing that agreeable office, and earths and rocks reflecting the fragrance thus imparted to them ; this he thinks may well be set down to the imagination of the poet, or of those whom he is here content to follow. (Of the friction of the elephants, compare the notes on St. 6 and St. 15.)

St. 10. *All night on his herbs, &c.*—What is here meant by Cálidása is not, (as might be at first sight supposed) a spontaneous ignition of herbs by friction often issuing in the conflagration of forests,—a common subject of description in Indian poetry, though little accordant with the circumstances annexed to the fires in this stanza. It refers to *lambent* fires, like those described in Lucan's mysterious Druidical forest near Marseilles, (Pharsalia iii. 420).

—*non ardentis* fulgere incendia silvæ—

or those of Argolis in Seneca's Thyestes, Act. IV. (where though the terms are just opposite, the meaning is precisely the same)

Tota solet
Micare flammâ silva, et excelsæ trabes
Ardent sine igni—

or like those by which, in the special prodigy manifested in the commission of the Hebrew legislator at Horeb, (Exod. ii.) the plant "flames, but is not consumed." The authority given by the two commentators whom I have consulted on this poem, for enumerating this among phenomena of constant occurrence, is simply the *Ágama* or *Tantra*, the Indian Cabbala, venerated scarcely less than the *Nigama* or Vedas themselves, by the votaries of Siva and of his female energies or Sactis. The passage thus cited from the *Ágama* (without further particularity of reference) is given by Mallinátha as follows : रात्र.वेष धीषु तेजो निधाय रविरस्तं याति i. e. "The sun when he has deposited his rays for the night with the deciduous herbs, goes to his setting." And thence a friendly acquaintance, endeared by occasional absences, is established between the herbs and the rays to which they are nightly attached, of which poetical fable our author makes a very elegant use in the 30th stanza of this book.

11.

His steep defiles climbing, with petrified snows
Heap'd up, shooting aches through the strain'd heels and toes,—
The dames of Heaven's horse-headed quire, in array,
To high upper regions pursue their slow way:

Were it an ancient author of the western world who thus enumerated the cave-illuminating herbs among the wonders of Himalaya,—we should have little hesitation in referring his story to the phenomenon of the *fire-fly*, presenting to the eye of an unobservant stranger the appearance of sparks inherent in the trees or shrubs on which those insects play. But this origin can scarcely be ascribed with any probability to the existence of such a belief among the Hindus, to whom every thing regarding the खद्योत or fire-fly is most familiar: and its mention *in this manner* can only be accounted for by the disposition which characterizes them beyond all other people, not only to admit the customary occurrence of prodigies, (as more enlightened nations have been prone to do,) but to cease to consider them as such, and to class them among the most familiar objects of their daily experience.

I should add, however, that this particular belief, founded wholly on the Tantras, is one not commonly adduced in Hindu poetry: except in these instances of Cálidása's present work, and one in the *Sisupála-badha* of the poet Mágha, I am not aware of its occurrence, nor do I think it has attracted the notice of any European scholar. The *jyótismati* or *luminous plant*, which as was observed in St. 2, is mentioned by some as pre-eminent among the herbs divinely given to Himálaya, is one of the most common of Indian plants, the *heart-pea* (so called from the shape of its fruit), or *halicacabum cardiospermum:* and notwithstanding its name in Sanscrit, together with 18 others of which several are equally splendid in import, found in the Amara Cósha and other vocabularies, it has no properly luminous or blazing quality ascribed to it by any of those respectable authorities. And if we inquire concerning the most "sparkling" of Himálaya's medicinal herbs according to the scholiast on St. 2, I mean the magic *Visalya-karaní*, which was sought to restore life to the slain brother of Ráma himself, we find in the Lanca-kánda, § 80, the monkey warrior Suséna, in his minute directions given to his chief Hanumán, (that he might recover it from the millions of Gandharvas, Raxasas, and others who jealously watched it,)—describing indeed its yellow leaves, green fruit, its red and golden flowers, &c.,—but not a word of any भास्वत् or *illuminating* property.

Ibid. To spirits that rove, &c.—The English word *spirit* will rather be understood of a superhuman being, than of the spirit of a man: and indeed I am rather anxious for an interpretation which European taste requires, in order to give dignity to a circumstance like this, when introduced in connexion with the mysterious and supernatural fires that light up the caverns of Himálaya. The truth, however, must be told in the note, whether such management in the text be excusable or not: viz. that the वनेचराः or "forest-rovers" here mentioned were doubtless, in the mind of Cálidása as well as of his Indian commentators, mere *men;* i. e. किरातादयः the Cirrhadæ and other troglodytes of these mountains.

St. 11. *Heaven's horse-headed quire.*—Amongst the bizarreries of Hindu mythology, is that of giving the heads of horses to the heavenly musicians, who are thence

With loins sorely wearied, and labouring breasts,
The zealous firm band yet desists not, nor rests.

12.

He, King of Hills, keeps from the Sun's killing gaze,
Close hid in his caverns' impervious deep maze,
The Genius of Darkness:—who owl-like, below,
There broods unperturbed and safe from his foe.
When th' humble man truly such refuge can find,
The high-headed patrons must be passing kind.

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called, from the surprise naturally excited by their appearance (in the same manner as the Manna that fell in the wilderness received its interrogatory name) किन्नराः or किम्पुरुषाः as if we should say in English *What-men!* The place of these *Kinnaras* in the creation is laid down by Mann 1. v. 39. See also Moor, Ward, &c.

St. 12. Whether Cálidása in the last two lines of this curious stanza intended a compliment to patrons, and particularly to the great monarch VICRAMADITYA, whose splendid protection of genius and merit, (perhaps indigent or oppressed by envy) he himself so largely shared, at an era preceding by a very few years that of the Roman AUGUSTUS,—or whether it is to be taken as an oblique satire on the उच्चैःशिरसः or "high-headed" patrons of humble men generally, it is not possible in the dearth of all properly historical and biographical materials, to determine with any probability. But however this may be, the word ममत्वं *mamatvam* is here undoubtedly to be taken in a simply good sense for *partial or friendly regard.* Though properly meaning regard to a thing *as my own*, agreeably to its derivation from the genitive *mama* (*quasi Latinè* MEITATEM *diceres, Græcè* EMOTHTA) —and therefore according to Hindú theological principles requiring, equally with the अहंकारः *ahankára* derived from the nominative of the same pronoun (*viz.* το ΕΓΩ, or "le MOI" of Marmontel, &c.) to be extirpated from the breast of the perfectly wise man, who is to see all things in God, and to be as free from partial attachment of any kind as from gross selfishness,—yet in all but Vedantic writings, the former word is as generally used in an amiable sense, as the latter is in the reverse. Even the *Dévi-máhátmyam* of the Marcandéya Purána, intended mainly to shew how the Vaisya Samádhi at length attained eternal beatitude by expelling both these feelings from his bosom,—represents the *mamatvam* or *mamatá*, of which he required to be cured, as one of the kindliest of human sentiments,—*viz.* a fond attachment to, and regret for the loss of, a wife and children, who had ungratefully used and deserted him. But perhaps a more distinct idea of the application of this word and of its origin may be obtained from the following very homely distich, which I find in the metaphysical play *Prabódha-Chandródaya*, or Rise of the Moon of Intellect—(a drama intended to teach the rigid stoical doctrine above alluded to,) Act 5, Scene 2.

मार्जारभक्षिते यादृङ् ममता गृहकुक्कुटे
न तादृङ् ममता शून्ये कलविङ्के ऽथ मूषिके

i. e. "Such kind and partial regret (*mamatá*) as is felt for a domestic fowl devoured by the cat, we feel not for a mere sparrow so killed, still less for a mouse."

13.

For him the large Yáks in his cold plains that bide
Whisk here and there, playful, their tails' bushy pride.
And evermore flapping those fans of long hair
Which borrow'd moon-beams have made splendid and fair,—
Proclaim at each stroke, (what our flapping men sing)
His title of honour "The dread Mountain-King!"

14.

On him, when their conscious self-stripping ev'n shames
The frolicsome spirits of Heaven's piping dames,
To please them, the clouds have a thick curtain made,
Which o'er the cave's mouth drops its shelt'ring broad shade.

St. 13. Of the Yák or *Bos grunniens*, a description may be found in Hamilton's Hindustan, vol. ii. p. 569, in the midst of the description of Thibet,—or in any book of Natural History written subsequently to Turner's Embassy to that country. The conceit contained in these lines of Cálidása, is one which I fear will scarcely approve itself to the taste of European readers: and can only be understood by explaining 1. that of the hairy tail of this animal, called चमर *Chamar*, the Hindús make the flappers commonly used for brushing away flies and musquitoes, which are thence called in Sanscrit चामरं or चामरी but in the common Hindvi language चंवरी i. e. چونري or *chowrie*: and 2. that the waving of such a chowrie set in a golden handle over the head of a Prince or over the image of a God, is accompanied with the proclamation of his name and titles, and reckoned among the constant emblems or insignia of royalty. [A most striking example of the importance attached to this may be seen in Col. Tod's Annals and Antiquities of Rajasthan, p. 265, where an apparition of the sanguinary goddess of Chittore, (a form of our Parvati) demands twelve regal victims as the price of her continued protection of the city from the Tatar invaders of the close of the 13th century. "On each day enthrone a prince: let the kirnia, the chehtra, and the *chámra* proclaim his sovereignty, and for three days let his decrees be supreme: on the fourth let him meet his foe and his fate. Then only may I remain." The terrible history that followed the promulgation of this supernatural announcement must be fresh in the mind of every reader of that deeply interesting work.] Hence the fancy of the poet: that the grunting ox, frisking in his natural state on the high table-land of Thibet and Nipál, anticipates his fine tail's future destiny, and flaps it to proclaim the honours of his wild liege lord "Himálaya, King of mountains."

St. 14. The poet here returns to the female Kinnaras or heavenly musicians, whom he left in St. 11, pursuing their laborious way to the upper regions, and glad to disengage themselves of any clothing that would impede their progress. He brings them to the mountain-caverns, ever the favourite residence of heathen deities, of female deities especially;—in the words of old Hesiod, (Theogon. v. 129.)

θεῶν χαρίεντας ἐναύλους
Νυμφέων αἳ ναίουσιν ἀν' οὔρεα βησσήεντα.

The covering dropped from the clouds to hide them from view, is vindicated from every unnatural exaggeration by the following passage in p. 348 of Fraser's

15.

His wind,—whether bearing along the chill spray
Far scatter'd from where, on its snowy white way,
Down dizzy heights plunging, great Ganges' young river
Full darts its precipitous torrent for ever,—
Or shaking the fragrance of tall cedar trees,—
Or spreading the peacocks' tails out to the breeze,—
Is hail'd in its cold, sweet, or languid career,
By tir'd mountain-hunters that chase the swift deer.

Tour to Himálaya. " We had projected the ascent of a snowy peak directly behind Seran; but on the day intended, the clouds *fell down* to the foot of the hills, enveloping all in the most complete and impenetrable darkness. It was not like a common mist: it was really a *sinking of the clouds* from the rarefaction of the atmosphere *till they quite shrouded us.*"

St. 15. *Shaking the fragrance of tall* CEDAR *trees.*—So I render the word देवदारु déva-dáru, which is the *Pinus Deodaru* of Dr. Roxburgh, and which, as Dr. Wallich informs me, is very nearly allied to the cedar of Lebanon so celebrated in Western Asia. It abounds in the high regions of Nipál and westward, but never at a less elevation than 10,000 feet above the sea: its wood is hard and durable, retaining a lasting fragrance: the turpentine extracted from it, far exceeding other kinds in scent. A full account of the tree, (though not a good drawing) is given by Mr. Lambert in his splendid work on Pines.

Cálidása in his other great mythological poem the *Raghu-vansa,* Canto ii. St. 36 and seq., tells a wonderful history of one of these Dévadáru cedars that was adopted by our goddess Párvatí, and nourished as her own daughter: and who, when lacerated by the forehead-rubbing elephants (in the manner described here, St. 7 and 8,) had a guard placed over her by Siva at the instance of his beloved Párvatí, in the person of his servant Kumbhódhara, turned for that special purpose into a fierce lion. [The whole however turns out at the end, to be but a magic scene got up by Nandiní the sage cow of Vasistha, in order to try King Dilípa's fidelity and devotion to her. See note on St. 23.]

Ibid. Is hail'd, &c.—In repeating here the triple character of the light breezes of Himálaya, I follow the ideas of the Indian commentators. The " tir'd *mountain-hunters*" are the same Kirátas whom we had before in St. 6. The *salutation* of the refreshing breeze after a weary chase, as implied in the word आसेव्यते, may remind us of the invocation under the same circumstances of the hunter Cephalus, (so fatal to his jealous wife Procris. Metamorph. vii. 837).

Egredior, silvasque peto: victoique per herbas
AURA, VENI, dixi, *nostroque medere labori.*

And I should remark, that it is the same kind of *worshipful welcome* and nothing further, that is intended by the kindred word निषेव्य in St. 5—i. e. the holy devotees first " *hailing*" (not religiously adoring) and *willingly seeking* for shelter the huge shades of the mountain clouds; which, higher up, turn to chilling rain and mist.

16.

On his crowning lake, as the lotus-flowers grow,
The seven blessed RISHIS pluck some ere they blow,
T'adorn the fifth heav'n : while the Sov'reign of day,
As circling beneath, he with upward strong ray
Peers o'er the calm waters, the rest ripes apace,
And opes to full bloom their enchanting soft grace.

St. 16. *On his crowning lake.*—The word सरस् or *lake* occurring only as a member of the compound epithet of the lotus flowers, might be translated with equal grammatical correctness, *lakes* in the plural. If a single lake only be intended, which the epithet ऋग् or *crowning* and other circumstances, seem to make by far the most probable interpretation, it can scarcely be any other than that called in modern Hindvi language Mansarour, from the Sanscrit मानससरोवर i. e. the great lake Mánasa, situated in the centre of Himálaya, 31° N. 81° E. in an oblong basin of 15 miles by 11, inclosed by the principal range to the south, part of the Kailása range peculiarly sacred to Siva on the east, and other high mountains and table-land on the north and west: a lake frequented as a place of pre-eminent sanctity by Hindu pilgrims,—but before Mr. Moorcroft's visit scarcely known to Europeans. If however, with Mallinátha, we suppose several high-mountain lakes to be here meant, we may join with the Mánasa the lake of Ravana westward of it, whence issues the great Satadru or Sutlej river, and others: particularly such as Hindu imagination or the report of probably mendacious pilgrims has fixed on the inaccessible summit of the high peak Bunder-pooch, (वानरपुच्छ *Vánarapuch'ha*, the tail of the Monkey Hanumán.) See Asiatic Researches, vol. xiii. pp. 189, 190. What the poet however says here, or seems to say, concerning the lake Mánasa,—he has elsewhere said of the Ganges, which had been commonly, but erroneously supposed to spring from it. For thus says Ráma to Sitá in the *Raghu-vansa*, Canto xiii. St. 51, when describing the mystic forest of the sage Atri.

अवाभिषेकाय तपोधनानां सप्तर्षिहस्तोद्धृतहेमपद्मां।
प्रवर्त्तयामास किलानसूया त्रिस्रोतसं त्र्यम्बकमौलिमालां॥

"Thither, for the due ablution of sages whose wealth is austerity, has Anusúyá (the wife of Atri) turned the course of Ganges flowing through the three worlds, the diadem of the three-eyed Siva, *her whose golden lotus-flowers are plucked by the hands of the seven Rishis.*"

But the intention of Cálidása in this stanza, as his commentators truly say, is to close his description of Himálaya by a splendid instance of अतिशयोक्ति or *hyperbole*, such a one as, in the words of the rhetorical poet Dandí whom they quote, is लोकसीमातिवर्त्तिनी i. e. *transcending the limits of the worlds.*

——vivida vis animi pervicit et extra
Pervasit longe flammantia mœnia mundi.

For not only does he state the highest summits, to rise above the planetary sphere, (to use the terms of the Hindu and the Ptolemaic astronomy,) so that the Sun can

17.

In him, then, the Father of Heav'n and of Earth
Beholding a nature which freely gave birth

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only look upwards at their crowning lake,—but above the yet higher sphere of the fixed stars,—even to the highest visible celestial sphere occupied by the seven Rishis, (Maríchi, Atri, Angiras, Pulastya, Pulaha, Kratu and Vasistha,)—whose stations in the pre-eminently favoured seven stars of the Great Bear, are thence imagined by the Hindús, in despite of long astronomical observation, to retain ever the same position with respect to the poles of the earth, unaffected by the precession of the equinoxes, that changes the declination as well as the longitude and right ascension of all inferior stars. Thus the *lóka* or world to which these yet unblown flowers are transferred by the hands of the blessed Rishis is removed by two or three steps above that of Indra, Surya, and the other celestial gods, and is only below the seventh *lóka*, the abode of Brahmá: which makes it the fifth when the earth is not included. See Wilson's Dictionary, Art. लोक.

We need not wonder therefore that in the general destruction of the three lower worlds, the earth, the region of Munis, and the solar heaven, by a flood at the close of the Manvantara,—in which the pious King Vaivasvata alone was preserved in an ark, accompanied by the seven Rishis,—the highest peak of Himálaya should yet appear above these waters: and that the Rishis should be commanded by the Divine Preserver (in the shape of a fish), to fasten the ship's cable to this peak, (the Hindú Ararat,) "thence called," says Vyása, "*Naubaudhanam* or the *ship-binding* even to this day." For so we read in the *Aranya-parva* or 3rd Book of the Mahábhárata, in the episode *Matsyópákhyánam*.

अथाब्रवीत्तदा मत्स्यस्तान्ऋषीन् प्रहसन् शनैः ।
अस्मिन् हिमवतः शृङ्गे नावं बध्नीत माचिरं ॥ ४७ ॥
सा बद्धा तत्र तैस्तूर्णमृषिभिर्भरतर्षभ ।
नौर्मत्स्यस्य वचः श्रुत्वा शृङ्गे हिमवतस्तदा ॥ ४८ ॥
तच्च नौबन्धनं नाम शृङ्गं हिमवतः परं ।
ख्यातमद्यापि कौन्तेय तद्विद्धि भरतर्षभ ॥ ४९ ॥

Though M. Bopp, in his ingenious preface to the German translation of this episode (published in 12mo. under the title of *Die Sündflut*, at Berlin, in 1829,) labours to distinguish this simpler account of the flood from that translated by Sir W. Jones, in As. Res. vol. i. No. ix. from the more recent Bhagavat-Purána, the word लोकान् in the 28th verse of the former (which cannot be properly translated *geschopfe* or *leute*, "creatures or men"—instead of *welten* or "worlds"), proves this deluge at least to be no less universal than that ascribed by the Bhagavat to the close of the Manvantara: nor does this mention of the peak of Himálaya above the waters (which is not in the Bhagavat) at all oblige us to suppose a more limited flood to be intended by the older writer.

Ibid. And opes, &c.—The causal verb प्रबोधयति in this stanza is explained by the Scholiasts विकसयति i. e. "opens to full bloom." This meaning does not occur in vocabularies: and I therefore mention it here. (Compare St. 32).

To each sev'ral limb of the sacred oblation,
And adequate strength to the world's sustentation,—
Decreed of himself, when to all his great mind
Their portion of dues sacrificial assign'd,
That lordly HIMÁLAYA ever by right
Should claim sov'reign power o'er each mountainous height.

18.

He therefore, high ME'RU's sole worthy compeer,
To keep his proud lineage untainted and clear,—
Did thence to himself, with divine nuptial rite
The noble nymph ME'NÁ most wisely unite;
Whom, sprung from the PITRIS' pure spirit alone,
Ev'n MUNIS might honour and take for their own.

St. 17. *A nature that freely gave birth*
To each sev'ral limb of the sacred oblation.—These words are but the necessary expansion of a single Sanscrit compound, यज्ञाङ्गयोनित्वं which begins the stanza. The *limbs* (अङ्गानि) alluded to, are the flowers and fruits—the sacred grasses, *kusa*, *dúrva*, &c. together with the wood and all other materials required for sacrifice, which are so abundantly produced by the mountain.

St. 18. *He therefore, high Méru's sole worthy compeer.*—The adjustment of supremacy between Himálaya the highest of mountains in the world, and the peculiar glory of India on the one hand—and Mount Méru on the other; which apart from fable, should seem to have been the central spot of the Brahmanism that from the north invaded and subjugated the peninsula, (and which if the testimony of Strabo, Arrian, Diodorus Siculus, Pliny, Eustathius, and others may be admitted respecting the Indian tradition of ancient times,—must be placed near Nyssa in the mountains of Hyrcania or Margiana, not far from the S. E. extremity of the Caspian in northern Khorásán), seems to be rather a difficult point with Hindú mythological writers. The celebrated mystical episode of the Mahábhárata, the Bhágavad-Gíta, gives the same supremacy among mountains to each separately: for where Crishna in the 13th chapter represents himself as identified with the chief of all orders of creation, as the *Bhrigu* of Rishis, the *Sun* of A'dityas, the *Sáma-Véda* of sacred books, &c. &c. we find him v. 23, saying, मेरुः शिखरिणामहं "I am the *Méru* of craggy mountains," and in v. 25 स्थावराणां हिमालयः "the *Himálaya* of hills,"—giving, apparently for the purpose of thus honouring Himálaya, a second mention of mountains which is not allowed to any other order of beings. And we have seen in our St. 2, how elsewhere in the Mahábhárata and the Puránas, a compromise is made between the most sacred central mountain and his snowy compeer, by making the former the milker *by* whom,—the latter the calf *for* whom,—the choicest treasures of the parent Earth are extracted.

With respect to our present history, we find in the 36th, 37th, and 38th sargas of the 1st Book of the great Rámáyana, called respectively गङ्गोत्पत्तिः उमामाहात्म्यं and कुमारोत्पत्तिः i. e. the birth of Gangá, the great deeds of Umá, and the birth

19.

To this divine pair, as in fond embrace due
To conjugal union, the joyous time flew ;—
The mountain-king's bride, yet in lovely youth's bloom,
A new precious burthen conceiv'd in her womb.

20.

And soon she brought forth the hill-queen's darling pride,
Mainácа, who since to old Ocean allied

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of Cumára [I. p. 343—359 of Carey and Marshman, or I. 143—147 of Schlegel], —that this point is in a manner settled by making Méru the father-in-law of Himálaya, i. e. the father of that very noble nymph Méná, and through her the progenitor of Gangá and Umá, the illustrious daughters of Himálaya, as well as of the god of war Cumára or Cárticéya, the offspring by one of them of Siva. It may seem strange that Cálidása, when about to pursue at length, and in a style of more ambitious ornament, a story that Válmiki has summed up thus briefly, should have departed so widely as it appears in his facts from an authority held so sacred. Not only does he here deny by implication Méná's origin from Méru, (who is here so distinctly mentioned with reference to Himálaya), by describing her as sprung from the *manas* or mental substance of the Dii Manes or paternal gods, (whose properties and order in the creation may be seen at length in Manú, Ch. iii. v. 192—201) : but he also in the succeeding stanzas, suppresses every mention of Gangá or Ganges as the elder sister of his heroine Umá : mentioning only in that rank of seniority, the comparatively unimportant Mainácа.

Cálidása however has ample authority in the Puránas for his statement. Thus the Scholiast Mallinátha, (who explains मानसीं कन्यां here by सङ्कल्पजां i. e. "born from the mere volition" of the Dii Manes or Pitris)—cites in confirmation of St. 18, 19, 20,—the following distich from the Brahmánda-Purána—where we have the same mutual relation of the Pitris, Méná, Himálaya, and Mainácа laid down, (without mention of Umá),

तेषां तु मानसी कन्या मेना नाम महागिरेः ।
पत्नी हिमवतो यस्याः पुत्रौ मैनाक उच्यते ॥

and also the following from the Vishnú-Purána, making Méná daughter of the Pitris—and assigning to her a highly spiritual and contemplative character (agreeable to what we read here in St. 22) as well as to her sister Háriní.

तेभ्यः शुभा सुता यज्ञे मेना वै हारिणीतिच ।
ते उभे ब्रह्मवादिन्यौ योगिन्यौ चाप्युभे द्विज ॥

St. 19. This verse is omitted in my Malayalim manuscript, but its existence in every other that I have consulted, as well as the internal evidence of its style and language, bespeak its genuineness.

St. 20. *Mainácа* surnamed Sunábha, once a *mountainous island*, is now, since this act of "Vritra's foe" or Indra [see Mahábhárata IV. § 4 entitled *Vritra-badha*] a *sunken rock* in the gulf (or rather strait) of Menár, that separates Lancá or Ceylon from the Indian continent. He is introduced by Válmíki as himself telling the story of this catastrophe : which as it belongs to a part of the Rámáyana (the 5th book or *Sundara-kánda*, 8th section or *sarga*) which has not yet

In bands of strict friendship, alone scap'd the blow
Aim'd full at each mountain by VRITRA'S stern foe.
Their wings were all clipt by the Thund'rer's fierce ire,
But his, the fell bolt left unscath'd and entire.

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been published at Serampore or Bonn, may be given entire, with a translation in corresponding *Anustup* measure.

The Monkey chief Hanumán, son of Pavana or Máruta (the Indian Æolus), while springing over the strait to Lancá, is accosted from below by Maináca, begging him to alight, and partake of rest and refreshment from his hospitality. After some dialogue upon this,—Hanumán at length expresses astonishment at Maináca's condition in these words, and receives the following reply :

समुद्रस्याप्रमेयस्य महामकरसंकुले ।
किं त्वमत्रार्जले धीमन् विमूढो ब्रूहि कारणं ॥

एवमुक्तः शुभं वाक्यं सुनाभः पर्व्वतोत्तमः ।
प्रत्युवाच हनूमन्तं वाक्यज्ञं वाक्यकोविदं ॥

पक्षवन्तः पुरा शैला बभूवुः शीघ्रगामिनः ।
व्रजन्ति स्म दिशः सर्व्वा गरुडानिलरंहसः ॥

ततस्तेषु व्रजत्स्वेव देवसङ्घा महर्षयः ।
भूतानि च भयं जग्मुस्तेषां पतनशङ्कया ॥

ततः क्रुद्धः सहस्राक्षः पर्व्वतानां सहस्रशः ।
पक्षांश्चिच्छेद वज्रेण तत्र तत्र शतक्रतुः ॥

स मामुपगतः क्रुद्धो वज्रमुद्यम्य देवराट् ।
ततोऽहं सहसा छिन्नः पवनेन महात्मना ॥

अस्मिन् लवणतोये च प्रक्षिप्तो वानरर्षभ ।
गुप्तपक्षः समर्थश्च तव पित्राभिरक्षितः ॥

HANUMA'N.—In Ocean's boundless waste, o'erspread
With huge sea-monsters crowding nigh,
Why hid'st thou thus thy wave-merg'd head ?
Tell me, sage Mountain, tell me why.

MAINA'CA.—Erst, mighty chief, on wings forth flew,
Free through all space, the Mountain bands,
Swift as the bird that bears Vishnu,
Or heaven's loud blast that scours the lands.

But as they soar'd aloft, strange fears
Did Rishis, gods and men surprise,
Dreading their fall ; and heaven's King rears
His bolt,—fierce lord of thousand eyes.

Then fell from thousand hills' sides low
The wings by vivid lightnings cleft.
But me, while yet the bolt-arm'd foe
Drew nigh,—unnerv'd, of hope bereft,—

21.

Next Siva's late consort, pure Satí once nam'd,
Who, towards her lov'd Lord with devotion inflam'd,

Thy pitying sire beheld : then straight
In his strong windy grasp he hore
Down to this briny depth, where fate
Threatens these shelter'd wings no more.

Here what is represented by Cálidása as the friendly act of Ocean, hiding the mountain under its waters,—is made by Válmíki the act of the God of Wind, hurrying the winged rock to the protecting depth,—and is therefore the subject of grateful acknowledgment to the Wind's son.

This catastrophe, (which may be perhaps paralleled in Northern mythology by Thor aiming his vengeful hammer at the Giants of the Mountains in mid-air, as told in the Edda of Snorro, Fab. 11,) is not unfrequently alluded to in the legends of the Hindús. Thus in the Kásí-kánda of the Skanda-Purána there is a soliloquy of the great mountain Vindhya, full of schemes of envy and ill-will against Méru, hut suddenly recollecting and deploring his impotence to execute them when deprived of wings ; and bitterly regretting the wanton petulance of some one of his race of old that had provoked the Thunderer to this act of severe vengeance.

शक्रं कोपयता पूर्व्वमस्मद्गोत्रेण केनचित्।
पक्षहीनः कृतो यत्र धिगपक्षस्य चेष्टितं ॥

St. 21. The voluntary burning of Satí, (whose name is here twice repeated सती सती, once as an epithet "*pure*" or "virtuous," and again as the proper name,) is among the best known and most constantly repeated tales of Hindú mythology ; and it is in memory of this that every self-devoted and self-immolating wife obtains the same sacred name of *Sati*, i. e. in another spelling of that very common hut often mis-applied term, is a *Suttee*. The case of the prototype differs materially, as we may here observe, from the posthumous devotion of her innumerable imitators : the affront which she thus heroically resented was offered to her undying lord, Siva, by Daxa, son of Brahmá, in omitting his distinguished son-in-law from an invitation to a grand sacrificial feast, at which all the other deities were to be present. The daughter went, though unasked : but finding only a confirmed continuance of the slight offered to her beloved hushand, she threw herself into the flame and thus spoiled the sacrifice : upon which Siva, who had been comparatively indifferent to the preceding affront, avenged her death in the terrible form of Víra-Bhadra,—beheading his father-in-law (who was afterwards resuscitated with the head of a goat suhstituted for his own), and dispersing his guests : and the several places to which the limbs of Satí were dispersed, in his dance of mingled triumph and lamentation, obtained an equal sanctity, and were honoured with the same phallic symbol, as were those which received the several mangled remains of the Egyptian Osiris hy the piety of his wife Isis. (Of these places called पीठस्थानानि, which are 51 in number, and held in peculiar veneration by the votaries of the Saktis, one distinguished one is at Cáli-ghát in the neighbourhood of this capital, which received the goddess's *fingers*).

Had giv'n her whole body a prey to the fire,
In wrath at affronts from old DAXA her sire,—
A new mother found for her birth to fresh life
In this beauteous ME'NÁ, the mountain-king's wife.

The freedom with which the self-disembodied Satí chooses parents for a new birth to fresh life, (inferior indeed in station to the former one, inasmuch as Pitris, gods, and Munis, yield in dignity to the ten *Brahmádicás*, of whom Daxa was one, i. e. the next after Brahmá, and his sacred Triad,)—is all in accordance with the doctrine of the Indian metempsychosis, which compares this change to the shifting of garments. So the Bhagavad-Gítá, II. 22.

वासांसि जीर्णानि यथा विहाय | तथा शरीराणि विहाय जीर्णान्
नवानि गृह्णाति नरो ऽपराणि । | अन्यानि संयाति नवानि देही ॥

To which may be compared a statement of similar liberty in Plato's Phædrus (vol. x. p. 326. ed. Bipont.)

Though Satí daughter of Daxa, is the first birth of the goddess *Sivá*, (or wife of Siva) a name which therefore equally designates Satí and Párvatí or Umá,—we are not to consider this as the first emanation of the all-powerful energy so personified. As Mahá-Máyá, or Prakriti, or Ambicá, the Great Mother, the principle of all nature, and variable or transitory existence,—she is Dévi or *the Goddess* by way of eminence, and holds a place in Hindú theology coeval with, and in some sort superior to, the Triad itself, Brahmá, Vishnu, Siva,—the triple form which the before quiescent and inactive deity (the neuter *brahma* or *numen)* assumed respectively for the Production, Support, and Destruction of the world. This characteristic feature of Gentile theology is detailed by Marcandéya, in that singular episode called the Dévi Máhátmyam, or exploits of this wondrous goddess—where, in the first chapter, she is described by the Rishi Médhas as lulling Vishnu the preserver into a deep sleep, by which the world's creator, Brahmá, is threatened with destruction: who accordingly invokes the goddess as विश्वेश्वरी, or lady of the universe, and superior to himself, Vishnu and Siva,—beseeching her, that she would leave his preserver to awake and destroy the invading demons. In the next chapter we have the same goddess springing into more visible existence from the united splendours and energies of all the celestial deities, when expelled from heaven by the demon Mahisha,—on which occasion Himálaya among the rest presented her with jewels and with her attendant lion: thus armed as the terrible Durgá, she destroys Mahisha, and receives the homage of all the immortals. Her incarnation in the beautiful form of Gáurí, Sivá, or Párvatí the nymph of Himálaya (from which she emerges in another form, to encounter the demons Sumbha and Nisumbha), is said in the 4th and 5th chapters, to be subsequent to this, as well as several other more terrible incarnations, which she specifies herself, (after her exploits as Cálí and concentrator of the energies of all the gods,) in the 11th chapter. But it is remarkable that in neither place where the birth of Párvatí is mentioned in that book, (IV. 33—35, and V. 40—43) is any allusion made to her preceding birth from Daxa as Satí: and the same omission is equally observable in the chapters respecting Umá in the 1st Book of the Rámáyana.

22.

Of her, then immers'd in devotion's thoughts deep,
Begot by the monarch of ev'ry high steep,—
Did Siva's lost love once again upon earth
Derive from new parents a fortunate birth.
Ev'n thus, in the womb of *Morality* pure,
'Midst earth's turbid toil still unshaken and sure,
By strong *Perseverance*'s virtue, I wot,
The infant *Prosperity*'s ever bégot.

23.

For blest was that birth-day,—its sky beaming fair ;
No cloud of earth's dust ever soil'd its pure air :
Loud conchs' swelling blast, follow'd close by sweet flowers
Rain'd down from glad skies, usher'd in its gay hours :
And moving or fix'd, ev'ry bodily thing
Partook the loud joy of the great mountain-king.

St. 22. The comparison of sensible to intellectual objects, though very rarely (and as some opponents of the Ossianic poems contend, *never*) occurring in the poetry of the rude and heroic ages of the world, is not uncommon in that of a more cultivated and reflecting state of society ; and in a people so metaphysical in the cast of their minds as the Hindús might be expected more frequently than in others. A very curious instance of this inverted species of simile occurs in our author's *Raghu-vansa*, Canto xiii. St. 60—where the subject matter of comparison is the plucking of the lotus flowers from the parent lake of the Saryú river by the hands of the female Yaxa deities (resembling what was described in St. 16 of this book) —and where this sensible object is illustrated by one which can only be understood by those who have entered into the intricacies of the Sánkhya metaphysical philosophy. The latter half of this stanza is another remarkable instance of the same kind of comparison, as it is also of Indian *allegory*. Niti (fem.) or *morality*, might more exactly, as to etymology, and almost equally well as to meaning, be rendered *conduct*. Utsáha (masc.), which in the original as well as in the translation, is linked with the word guna, quality or virtue,—means *strenuous and persevering exertion*. Sampat (fem.) is *wealth*, *affluence* or *prosperity*.

St. 23. The falling of a shower of flowers from heaven is a token of the pleasure and approbation of the celestial gods. Thus, in the *Raghu-vansa* of our author, II. 60, when the pious king Dilípa offered to devote his own life instead of that of the cow Nandiní to Siva's lion before mentioned that guarded the sacred cedar of Párvatí,—and his offer was accepted by the hungry wild beast,—his deliverance from expected death, and the breaking of the spell by the immortals that applauded his fidelity, was preceded by that sign.

तस्मिन्क्षणे पालयितुः प्रजानाम्
उत्पश्यतः सिंहनिपातमुग्रं ।

अवाङ्मुखस्योपरि पुष्पवृष्टिः
पपात विद्याधरहस्तमुक्ता ॥

24.

And gloriously well, with a daughter so bright
As seem'd a new orb of pure orient light,
Did she, the fair mother, herself doubly shine:
So glows with fresh splendours VIDU'RA's fam'd mine;
When, cleft by electric new clouds' starting sound,
Its thunder-struck jewels dart out from their ground.

"At this instant, over the protector of his subjects" (ποιμένα λαῶν in Sanscrit) "as with face averted, he expected the dreadful spring of the lion—a shower of flowers fell, sent forth from the hands of the celestial *Vidyádharas*." [This approbation ended in the sacred cow permitting herself to be milked by the king in a leafy pail of that which he most desired,—the gift of *offspring* to perpetuate the race of Raghú, from which the great Ráma was to spring. Compare St. 2, suprà.]

Ibid. The mountain-*king* is not mentioned in the original of this stanza. But the Sthavárás or *fixed* beings peculiarly denoting *mountains*, their sympathy with their king's joy seemed a proper addition to the mention of their own.

St. 24. *Did she, the fair mother.* Some copies, and those not uncommon in Bengal and Hindústan, instead of सवित्री or *mother*, have धरित्री *the earth*: thus instead of the lovely Méná, making the universal mother Earth to shine by so beautiful an occupant. A meaning which beside being insipid in itself, utterly destroys the spirit of the comparison that follows. The commentaries of Mallinátha and Bharata-Mallica prove that they both read Savitrí.

Ibid. VIDU'RA, the Sanscrit for "remote," is also the proper name of a mountain said to produce the *lapis lazuli*, which is thence called बिदूरज and वैदूर्य. The curious native treatise on various subjects of natural history, called *Calpayukti*,—opens its account of the *parixa* or test of this precious stone, by the following extraordinary lines, which fully illustrate the meaning of Cálidása here.

कल्पान्तकालक्षुभिताम्बुराशेर् | वैदूर्य्यमुत्पन्नमनेकवर्णं
निर्ह्रादतुल्यादितिजस्य नादात् | शोभाभिरामद्युतिवर्णबीजं ॥
अविदूरे विदूरस्य गिरेरुत्सङ्गदेशतः ।
कालबद्धकसीमा च मणेस्तस्याकरो ऽभवत् ॥
तस्य नादसमुत्पत्त्यादाकरः स महागुणः ।
अभवत्त्वरितो लोके लोकत्रयविभूषणः ॥
तस्यैव दानवपतेर्निनदानुरूप
प्रावृट्पयोधररवार्जितचारुरूपाः ।
वैदूर्यरत्नमणयो विविधावभासास्
तस्मात् स्फुलिङ्गनिवहप्रतिभा बभूवुः ॥

"From a cry of the giant son of Diti, resembling the roaring of the troubled ocean at the close of the Calpa, sprung the variegated *vaidúryam* (lapis lazuli); source of colours of a bright and ravishing splendour. Not far from the declivity of Mount *Vidúra*, was the mine of that precious stone, but limited to particular seasons for its production, and then closed. First from the origination of that demon cry, did this mine suddenly spring in the world,

25.

As first, a thin streak of soft silvery light,
The gleaming new moon in the West meets our sight,

---

eminent in its properties, the ornament of the three worlds : but ever since, on the muttering of the clouds of the rainy months (July and August), imitating the sound of that prince of demons, are those beautiful *vaidúrya* gems emitted, of varied lustre, and rapid effulgence as of a multitude of fiery sparks."

Mallinátha cites the second sloka of the above description, as from an anonymous *budha* or sage, to point out the mount Vidúra here meant by Cálidása : but the other Scholiast, Bharata-Mallica, erroneously explains Vidúra here as *prabálótpattisthánam*, i. e. a place where coral is produced,—a sense unknown to Sanscrit vocabularies. Except for the substitution of *coral* for *lapis lazuli*, he coincides with the above quotation—citing for the extraordinary phenomenon here mentioned the same Cabalistic authority from which we have the blazing herbs of St. 10 and 30; प्राव्डघनगर्जनात् प्रबालरत्नशलाकाः पृथिव्यामाविर्भवन्त्यागमः "From the muttering of the clouds in the rainy months (July and August), darts of coral gems make their appearance on the earth. So says the A'gama (or Tantra)."

The situation of VIDU'RA, if we may trust the Scholiast on the following parallel passage from the 12th canto of the *Naishadha* of Srí Harsha, is identified with that of mount *Róhana* or Adam's Peak in Ceylon. Among the many unsuccessful suitors of the beautiful Damayantí in that canto, is a Malabar prince of great riches and liberality, whom the goddess Sarasvatí thus recommends to the fair virgin's acceptance :—

अनेन राज्ञार्थिषु दुर्भगीकृतो
भवन् घनध्वानजरत्नपीवरः ।
तथा विदूराद्रिदूरतां गमी
यथा स गामी नव केलिशैलतां ॥

"Mount *Vidúra*, abundant in gems that spring forth at the sound of thunder-clouds, yet becoming unacceptable to the beggars (that before flocked to it) through this more munificent king,—shall, however remote as its name indicates, become so near (if you accept this Southern monarch) that it shall be to you as a pleasure mount." As the Scholia referred to illustrate the words of Cálidása before us, as well as those of Srí Harsha, they may be added for the satisfaction of the Sanscrit student.

एतद्वरणीशेऽतिप्रसिद्धो विशेषेण दूरोऽद्रिरथच रोहणाचलस्तया तेन प्रकारेण अदूरतां सामीप्यं गमी गन्ता यथा येन प्रकारेण नवकेलिशैलतां क्रीडापर्वतत्वं गामी गमिष्यति किंभूतोऽतिवदान्येन राज्ञार्थिषु याचकेषु विषये दुर्गमीकृत उपेक्षाविषयीभूतामयाचनीयतां प्रापितः अतएव व्ययाभावान्नवा घना मेघास्तेषां ध्वानः शब्दस्तस्माज्जातैरत्नैः पीवरः परिपुष्टो भवन् विदूराद्रिर्हि नवमेघशब्दाद्रत्नशलाका उत्पद्यन्ते तासु याचकैर्नीयन्ते अस्मिंस्तु वज्रप्रदे सति याचकस्यागमनाद्व्ययाभावाद्रत्नैः कृत्वा त्वदुपवनं त्वं यावन्मेदुरा भवसि स एव रत्नमयत्वात्तव क्रीडापर्वतस्थाने भविष्यति अति वदान्योऽयमिति भावः ।

St. 25. *As daily new digits, &c.*—The कला or Indian digit, is not as with European astronomers, $\frac{1}{12}$ of the diameter of the Moon's disc, but $\frac{1}{16}$ only.

So she, the sweet infant, appear'd: but full soon,—
As daily new digits annex'd to the moon
Give birth to new phases,—so she, day by day,
Grew still to fresh forms of more lovely array.

26.

Her, dear to her kindred, the relatives all,
As mountain king's daughter, did PÁRVATÍ call:
But after, when bent upon mortification
Most strict and religious, the fond deprecation
Burst forth from her mother, "Oh no!"—thence it came
That UM'A, "Oh no!" was the lovely girl's name,

There is therefore the accession of one of these for every *Tithi* or lunar day of the *suxla-paxa*, or waxing moon.

St. 26. PA'RVATI'.—This feminine noun पार्वती is the regular patronymic derivative from पर्वत *parvatas* or "mountain." The ascription of these two names, PARVATI' and UMA', to the goddess in her second birth, is related at length in the Siva Purána, 2nd part (or *uttara-khanda*), 13th chapter.

Ibid. When bent upon mortification, &c.—The same is told of Umá (as distinguished from her elder sister Gangá), by Válmíki, Rámáyana, I. cap. 37, St. 19.—(Vol. i. p. 148, ed. Schlegel.)

Ibid. That U-MA' "Oh no!" &c.—The latter Sanscrit particle मा *má* is (like its cognate *me*, ـمـ or ـمـ in Persic, μη in Greek) the dehortative "no," commonly prefixed to the imperative or optative mood; as न *na* (the same with the Persic, Latin, and Teutonic particle) is the simple negative "no" or "not," prefixed to the indicative. The former particle उ *U*, which is chiefly for want of an equivalent short word in English, rendered "Oh"—is one that is scarcely or ever seen in the ordinary classical language, though of very frequent occurrence in the older dialect of the Védas. There it may be found often annexed as if it were a termination to the several cases of the demonstrative pronoun तत्, or to prepositions in composition, when in that ancient Sanscrit (as in Greek and in German, though the *tmesis* is not admissible in common Sanscrit), they are separated from their verbs*; and not unfrequently annexed separately to verbs or to nouns, preceding or following:—in all these cases apparently bearing a meaning *intensive* of the word to which it is annexed,—viz. (that which so often belongs to the common एव) "*precisely*" or "*merely*." Thus we find it in the following verses from the *I'sá-vásya* Upanisad, which is the closing 40th chapter of the great Sanhitá of the YAJUR VE'DA, the Vája-Sanéya-Sanhitá of Dadichi Muni, which I quote also as apposite to the subject of this stanza, to shew how the balance is carefully struck between the active and contemplative duties, in this most venerable and ancient authority of Hindú religion (vv. 12, 13, 14, but in some copies 9, 10, 11).

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* It is not therefore with perfect accuracy, that the learned F. Rosen, in his Specimen of the Rig-Veda, published at London in 1830, p. 6, describes *udu* for *ut*, and *abhúdu* for *abhút*, as mere *variations* or *licenses* of the most ancient language. They are rather the annexations to the universal form of this expressive particle *U*.

27.

Though blest with a son, not on him did the sight
Of th' earth-bearing hill-monarch dwell with delight:
For thus in the genial spring season, when flowers
All various invite from its numberless bowers,
The swarm of fond bees will there only, where grows
The sweet mango-blossom, with pleasure repose.

अन्धं तमः प्रविशन्ति ये अविद्यामुपासते
ततो भूय इव ते तमो य उ विद्यायां रताः । १२ ॥
अन्यदेवाहुर्विद्याया अन्यदेवाहुर्विद्यायाः
इति शुश्रुम धीराणां ये नस्तद्विचचक्षिरे ॥ १३ ॥
विद्यां चाविद्यां च यस्तद्वेदोभयं सह
अविद्यया मृत्युं तीर्त्वा विद्ययामृतमश्नुते ॥ १४ ॥

Blind darkness do they incur, who cherish ignorance (i. e. action without contemplation).

But greater darkness, as it were, than this do they incur, who delight in knowledge *merely* [उ].

For one thing, they say, is gained by (contemplative) knowledge, another by ignorance (or action).

Thus have we heard from wise men, who have so instructed us:

He who knows how to pursue both, *knowledge* and *ignorance* (thus defined) together, Having by *ignorance* passed over death, by *knowledge* obtains immortality.

St. 27. The attachment of bees to the blossom of the mango, in Sanscrit चूत or अम्रत (*Chúta* or *Amrita*) is one of the common-places of Hindú poetry. See the songs of Jayadéva, as translated by Sir W. Jones, Works, vol. iv. p. 242, (8vo. edition). But a more elegant example of this cannot be found than what is furnished by Cálidása himself in the 5th Act of his justly celebrated drama, the Sakuntalá, where the following song from behind the scenes reminds King Dushmanta of his inconstancy to his first attachment.

Prácrit text.	Or in Sanscrit.
अहिणअ मडुलोहभावुओ	*Abhinava-madhu-lóbha-bhávukas*
तुह परिचुम्बिअ चूअमंजरीं	*Tava parichumbita-chúta-manjarím*
कमलरसदिमेत्तनिव्वुदो	*Kamala-rasátimátra-nirvritó,*
मडुअर विस्सरिसेसि णं कहं	*Madhukara! vismarishyasi nanu katham?*

i. e. word for word.
In-novi-mellis-cupidinem-conversus,
Tui osculum-olim-expertum-Mangiferæ-surculum
Loti-sapore-nimium-occupatus
O mellifer! oblivisceris sane quomodo?

28.

As lamps by their radiant crest of sharp flame,—
As heaven's path by Ganges, of far-flowing fame,—
As scholars by th' eloquent charm of pure speech,—
Their last and best forms of accomplishment reach;
So he by this daughter, the crown of his race,
Was cleans'd from all stain and adorn'd with all grace.

" How shouldst thou, O hee, turning to the desire of new honey, and occupied too entirely with the lotus's sweetness, forget the mango blossom which thou hast so often kissed?" A comparison with this text will shew that M. de Chézy's version of this, " *Se pourrait-il, abeille volage, &c.*" in p. 102 of his very splendid and valuable edition of the " Sacountala"—though somewhat paraphrastic, has greatly the advantage in point of correctness over that of Sir W. Jones—" *Sweet bee,* &c." (Works, ix. p. 464,) which is marred by the misplacing of a very significant clause. But M. de Chézy is utterly mistaken as to the metrical harmony of this exquisite stanza, which he supposes (in p. 227 of the notes) to be in the *A'ryá* measure of the kind called *Gíti,* (but *Udgáthá* in the Pingala,)—in order to which he is obliged to suppose a new license, inadmissible in that metre,—and has also, in this imagination, allowed a very faulty reading बिसुमरिसेसि for विस्मरिसेसि in the fourth line. The uniform succession of long and short syllables in these lines is sufficient to shew that they are not A'ryá lines of any kind. They are of a very common metre of alternate 10 and 11 syllables, called *Aparavaktram;* the distribution of which is, { 1 and 3. Proceleusm. Anapæst. Dijamb. / 2 and 4. Proceleusm. Choriamb. Dijamb.

St. 28. *Of far flowing fame.*—In the original त्रिमार्गेया i. e. " the triple-pathed," or " whose course is through the three worlds." See Amara Cosha, II. § 3. sl. 31, (p. 69. ed. Colebrooke). The question is put and answered in the Rámáyana, I. 37. St. 3.

त्रीन् पथो हेतुना केन स्रावयेल्लोकपावनी।
त्रिषु लोकेषु धर्मज्ञ कर्म्मभिः कैः समन्विता॥

" Why does Ganges, purifier of the worlds, flow in three courses—and by what works, O thou who knowest righteousness, is she attended, (i. e. for what is the accompaniment of her purifying water required,) throughout the three worlds?"

No other topic of this remarkable triple comparison requires illustration, except that by संस्कारवत्यागिरा in the third, is meant the utmost perfection and correctness of *Sanscrit* speech.

[*To be concluded in the September number.*]

उमोत्पत्तिः

अस्त्युत्तरस्यां दिशि देवतात्मा
हिमालयो नाम नगाधिराजः ।
पूर्वापरौ तोयनिधी*विगाह्य
स्थितः पृथिव्या इव मानदण्डः ।१।

यं सर्वशैलाः परिकल्प्य वत्सं
मेरौ स्थिते दोग्धरि दोहदक्षे ।
भास्वन्ति रत्नानि महौषधीश्च
पृथूपदिष्टां दुदुहुर्धरित्रीं ॥२॥

अनन्तरत्नप्रभवस्य यस्य
हिमं न सौभाग्यविलोपि जातं ।
एको हि दोषो गुणसन्निपाते
निमज्जतीन्दोः किरणेष्विवाङ्कः ।३।

यस्याग्रसानुक्रमणक्षमाणां ।
सम्पादयित्रीं शिखरैर्बिभर्त्ति ।
वलाहकच्छेदविभक्तरागाम्
अकालसन्ध्यामिव धातुमत्तां ॥ ४ ॥

†आमेखलं संचरतां घनानां
छायामधः‡ सानुगतां निषेव्य ।
उद्वेजिता दृष्टिभिरात्मयन्त्रे
मृगानि यस्यातपवन्ति सिद्धाः ॥ ५ ॥

पदं तुषारक्षुतिधौतरक्तं
यस्मिन्नदृष्ट्वापि हतद्विपानां ।
विदन्ति मार्गं नखरन्ध्रमुक्तैर्
मुक्ताफलैः केशरिणां किरातः ॥ ६ ॥

न्यस्ताक्षरा धातुरसेन यत्र
भूर्जत्वचः कुञ्जरबिन्दुशोणाः ।
व्रजन्ति विद्याधरसुन्दरीणाम्
अनङ्गलेखक्रियया उपयोगं ॥ ७ ॥

यः पूरयन्कीचकरन्ध्रभागान्
दरीमुखोत्थेन समीरणेन ।
उद्गास्यतामिच्छति किन्नराणां
तानप्रदाधिलमिवोपगन्तुं ॥ ८ ॥

कपोलकण्डूं§ करिभिर्विनेतुं
विघट्टितानां सरलद्रुमाणां ।
यत्र स्रुतक्षीरतया प्रसूतः
सानूनि गन्धः सुरभीकरोति ॥ ९ ॥

वनेचराणां वनितासखानां
दरीगृहेत्यङ्कनिषण्णभासः ।
भवन्ति यत्रौषधयो रजन्याम्
अतैलपूराः सुरतप्रदीपाः ॥ १० ॥

उड्डेजयत्यङ्गुलिपार्ष्णिभागान्
मार्गे शिलीभूतहिमेऽपि यत्र ।
न दुर्वहश्रोणिपयोधरार्त्ता
भिन्दन्ति मन्दां गतिमश्वमुख्यः ॥ ११ ॥

दिवाकराद्रक्षति यो गुहासु
लीनं दिवाभीतमिवान्धकारं ।
क्षुद्रेऽपि नूनं शरणं प्रपन्ने
ममत्वमुच्चैःशिरसामतीव ॥ १२ ॥

लाङ्गूलविक्षेपविसर्पिशोभैर्
इतस्ततश्चन्द्रमरीचिगौरैः ।
यस्यार्थयुक्तं गिरिराजशब्दं
कुर्वन्ति बालव्यजनैश्चमर्य्यः ॥ १३ ॥

यत्रांशुकाक्षेपविलज्जितानां
यदृच्छया किंशुकपादपानां ।
दरीगृहद्वारि विलम्बिबिम्बास्
तिरस्करिण्यो जलदा भवन्ति ॥ १४ ॥

* Some Malayalim MSS. have वारिनिधी.

† One Malabar MS. places this sloka after the next following.

‡ Some Bengal MSS. have छायामिषे.

§ Some MSS. have कपोलकण्डूः in the plural.

भागीरथीनिर्झरसीकराणां
वोढा मुहुःकम्पितदेवदारुः।
यद्वायुरन्विष्टमृगैः किरातैर्
आसेव्यते भिन्नशिखण्डिबर्हैः॥ १५॥

सप्तर्षिहस्तावचितावशेषान्
अधो विवस्वान्परिवर्त्तमानः।
पद्मानि यस्यायसरोरुहाणि
प्रबोधयत्यूर्द्धमुखैर्मयूखैः॥ १६॥

यज्ञाङ्गयोनिर्यमवेक्ष्य यस्य
सारं धरित्रीधरणक्षमं च।
प्रजापतिः कल्पितयज्ञभागं
शैलाधिपत्यं स्वयमन्वतिष्ठत्॥ १७॥

स मानसीं मेरुसखः पितॄणां
कन्यां कुलस्य स्थितये स्थितिज्ञः।
मेनां मुनीनामपि माननीयाम्
आत्मानुरूपां विधिनोपयेमे॥ १८॥

*कालक्रमेणाथ तयोः प्रवृत्ते
स्वरूपयोग्ये सुरतप्रसङ्गे।
मनोरमं यौवनमुद्वहन्त्या
गभीरभावद्भूधरराजपत्न्याः॥ १९॥

अस्तूत सा नागवधूपभोग्यं
शैलाकमप्योनिधिबद्धसख्यं।
कुद्वेऽपि पक्षच्छिदि दत्तशापाद्
अवेदनाजं कुलिशक्षतानां॥ २०॥

अथापमानेन पितुः प्रयुक्ता
दक्षस्य कन्या भवपूर्व्वपत्नी।
सती सती योगविसृष्टदेहा
तां जन्मने शैलवधूं प्रपेदे॥ २१॥

सा भूधराणामधिपेन तस्यां
समाधिमत्यासदपादि भव्या।
सम्यक् प्रयोगादपरिक्षतायां
नीताविवात्माहुगुणेन सम्पत्॥ २२॥

प्रसन्नदिक् पांशुविविक्तवातं
शङ्खस्वनानन्तरपुष्पवृष्टि।
शरीरिणां स्थावरजङ्गमानां
सुखाय तज्जन्मदिनं बभूव॥ २३॥

तया दुहित्रा सुतरां सवित्री†
स्फुरत्प्रभामण्डलया चकासे।
विदूरभूमिर्नवमेघशब्दाद्‡
उद्भिन्नया रत्नशलाकयेव॥ २४॥

दिने दिने सा परिवर्द्धमाना
लब्धोदया चान्द्रमसीव लेखा।§
पुपोष लावण्यमयान् विशेषान्
ज्योत्स्नान्तराणीव कलान्तराणि॥ २५॥

तां पार्व्वतीत्याभिजनेन नाम्ना
बन्धुप्रियां बन्धुजनो जुहाव।
उमेति मात्रा तपसो॥ निषिद्धा
पश्चादुमाख्यां सुमुखी जगाम॥ २६॥

महीभृतः पुत्रवतोऽपि दृष्टिस्
तस्मिन्नपत्ये न जगाम तृप्तिं।
अनन्तपुष्पस्य मधोर्हि चूते
द्विरेफमाला‡ सविशेषसङ्गा॥ २७॥

प्रभामहत्या शिखयेव दीपस्
त्रिमार्गयेव त्रिदिवस्य मार्गः।
संस्कारवत्येव गिरा मनीषी
तया स पूतश्च विभूषितश्च॥ २८॥

* This sloka is omitted in a Malayalim MS.

† Several MSS. have here धरित्री for सवित्री.

‡ Some MSS. have नादात् for शब्दात्.

§ Some MSS. have रेखा.

‖ Some MSS. have तपसे.

‡ Some MSS. adding *Visarga* in these two places, make the whole plural द्विरेफमालाः सविशेषसङ्गाः

II.—*Description of the Pan-chakí or Native Water-mill.*

On the mountain streams and rivers in the Northern *Doáb*, the Natives use a water-mill for grinding corn, which for its simplicity is well deserving attention, as it might be applied in all countries, where a fall of water can be commanded, and where a want of efficient workmen renders the complicated and expensive species of mill machinery, generally used, a matter of difficulty to manage or keep in repair. In the hands of the Natives and with the rude means that they have by them, it may be perhaps considered the only sort of mill that could be turned to any account, both from the absence of any complication in its parts, and from the simplicity of its construction, rendering it in any man's power for a trifling outlay, either to fix his mill at any point that may suit him, or to remove it at pleasure; the only weighty parts about it being the mill-stones, which however by running a stick through them, and yoking a bullock or pair of bullocks to them, may in the neighbourhood of roads or common tracks be also removed with as little difficulty or expense as the rest of the machinery.

A horizontal water-wheel with floats placed obliquely so as to receive a stream of water from a shoot or funnel, the said float-boards being fixed in a vertical axle passing through the lower mill-stone, and held to the upper one by a short iron bar at right angles, causing it to revolve with the water-wheel;—the axle itself having a pivot working on a piece of the hardest stone that can be procured from the shingle near at hand:—this with a thatched roof over it, and the expense and trouble of digging a cut so as to take advantage of a fall of water,—are the only articles required in this very simple mill. The plan is so obviously good, not only for the means gained, but also from the simplicity rendering the whole almost independent of repair, and so intelligible in its parts as to come within the comprehension of the simplest understanding, that it has been adopted generally in all the canals in the Delhi district, as well as in those of the *Doáb*; and with such success, that the introduction of such mills, wherever sufficient fall is provided, is as much an object, on account of the profit arising to the canal returns, as from the accommodation and convenience offered to the community, in providing the means for grinding corn.

On reference to the accompanying plate, it will be seen that there is only one motion, and that supposing the materials are good, the permanency of the machinery depends entirely on the lower pivot. It will also be evident that there is not a part of the whole machinery that could not be repaired and put in perfect order by the commonest village

workman, a matter of importance in the absence of mechanical skill and practised workmen. Whereas in the plainest undershot wheel applied to a mill for grinding corn, there are no less than three wheels of different descriptions; the change of vertical to horizontal motion;—and three pivots to keep in order, with a friction, even under the most skilful management, tending constantly to disarrange the parts, and render the accompaniments of a forge and blacksmith's shop absolutely necessary to keep the mill in order.

On the canals it has been found worth while to construct permanent buildings for these corn mills*, and although keeping most strictly to the original simplicity of the machinery, they are set up with greater care, and means are given for regulating the motion, &c. which renders the whole as perfect as it can well be.

It would appear that a fall of water (that is to say, the difference of level between the surface of the head supply and the float-boards of the water wheel), equal to three feet, is the minimum in which this species of machinery can be used with any good effect; and it has been found that with a fall of three feet, the dimensions of the shoot or funnel require an addition in width, to obtain that by weight of water, which the smallness of the fall will not give by velocity alone, and in the dimensions of shoot given to those of a higher class.

The following are the particulars of mills on the *Doáb* canal, divided into three classes from the depth of the fall; the width of shoot on the sill or waste-board, being 12 inches, and the discharge per second averaging 6.5 cubic feet: the diameter of mill-stones 27 inches, and thickness 12 inches;—the corn being ground into *atta* or coarse flour.

Class.	*Fall of water.* ft.	in.	*Atta ground per hour.* md.	seer.
No. 1	7	6	1	26
2	5	6	1	5
3	3	6	0	17

The common mills used in the Jumna and mountain-streams, are said to grind from 5 to 7 maunds of *atta* per day, or in 24 hours; the machinery being of the rudest description, the supply of water very small, and a great part of that escaping through the shoot before it touches the water wheel.

The return to Government on the mills is obtained generally by farming them out to contractors for fixed periods, who pay so much per day as long as a supply of water equal to that entered in the contract is provided, regulated by the depth of water on the sill or

* Vide Major Colvin's Report, p. 121.

waste-board; this return of course varies not only from the powers of the mill, but also from their position relatively to populous towns and cantonments. In the neighbourhood of Delhi the return is great, and demand for *atta* equally so; whereas at other points distant from towns, mills of equal power would not produce half the return. The *Doáb* canal, although possessing every advantage in fall and power of machinery, labors under a disadvantage in this respect, the town of *Saháranpur* being the only one throughout its whole extent where there is any great demand for machinery of this description. *Shámli*, although a large town, does not contain a great number of that class of people who purchase *atta*, each family grinding their own corn for home consumption; and although there are ample means for establishing mills at the south end of the canal opposite Delhi, (the canal falling into the *Jumna* with a descent of about 50 feet in a line of 12 miles!) it has been considered unadvisable to put them in extended practice, on the supposition that the mills already built on the Delhi canal in the city would suffer from the competition;—in short, that the mills *in* Delhi are sufficient to grind the corn *required* by its population.

The people from whom the millers look for profit are chiefly those of the *sipahí* class, travellers, those without families, idlers, &c. those who are regularly settled with their families, trusting as I before said to the hand-mill in their own house, and not purchasing from the mills excepting on marriages and other grand occasions, when the consumption of *atta* is more than their own mill could provide for. In military cantonments the whole of the *atta* and flour used is obtained from the mills; the vicinity therefore of a station of this description becomes a lucrative affair to the miller, in exemplification of which I may mention, that during the existence of the Provincial Battalion at *Saháranpur*, the canal mills at that place were kept constantly in their service, with little or no aid from the inhabitants of the town.

The profit derived by the renter of a mill depends in a great measure on his management, and on the rate per maund which he charges for grinding; but with an experienced and steady man, the following may be considered as a very close approximation to their daily profit. The rate per maund for grinding *atta* by the *Peesunyaris* or corn-grinders in the city, is generally three annas, for which sum they deliver the articles at the purchaser's house; at the water-mills two annas per maund is the usual charge, not however including the carriage of the grain to the mill, &c. the charge of two annas being simply for grinding.

The expenses to the miller for keeping 2 mills at work are thus,

Per month,	1 head miller's wages, ... Rs.	5	0	0
	1 assistant ditto ditto, ...	4	0	0
	1 weighman, ...	4	0	0
	Oil at $\frac{1}{4}$ seer per day, about	1	0	0
	2 seers of *atta* given per day to 2 millers, in addition to their regular pay, about	2	7	0
	Total expense per month, Rs.	16	7	0
	or per day, taking a month of 30 days, ...	0	8	$9\frac{1}{5}$

The receipts per day are as follows:

Supposing 55 mds. of grain ground at 2 ans. per md.				6	14	0
DEDUCT.						
Expenses as above, ...	0	8	$9\frac{1}{5}$			
Government rent, ...	5	0	0			
				5	8	$9\frac{1}{5}$
Balance of profit to miller per day, Rs.				1	5	$2\frac{1}{5}$

The above daily expenses would not be increased by an additional mill;—the profits to the contractor in that case could therefore be much increased; whereas a solitary mill would very nearly require the same establishment, and would therefore be less profitable; mills of a higher power also might be easily worked with the above scale of establishment.

At mills distant from towns, the payment for grinding corn is made in kind, varying from 2 to 4 seers per maund, which, at the usual rate of from 40 to 50 seers per rupee, is but a moderate return in comparison with that at the town mills. These village mills grind gram, barley, and Indian corn, as well as wheat.

The stones used on the canals are chiefly those from the quarries near *Agra*, *Rúpbas*, and *Fatihpur Sikri*, a coarse-grained sandstone which requires the chisel every second day,—there are three sizes used;

First size, diameter 36 inches, depth 12
Second ditto, — 30 inches, do.
Third ditto, — 27 inches, do.

The two latter are in most general use. Stones of the usual quality last for about 2 or 3 years, that is to say, at the end of that period a new upper stone is provided, and the old one placed below. In the native mills on the *Jumna*, stones about 22 inches diameter, and from 10 to

12 inches thick, are quarried in the vicinity of *Rájpur* north of *Dehrah*; they appear to me of an inferior description, though of various qualities ;—the native millers, however, prefer some of them to the *Agra* stone, and it is not impossible that some of the best variety from *Rájpur* may be superior to the worst from *Agra*, but generally speaking the preference is decidedly in favor of the latter.

The best method of delivering the water from the shoot on to the float-boards, appears to be that represented in the accompanying sketch, and which has been generally practised on the canals in pursuance of the usual course adopted by the natives. A trial made at Hansi, in which a horizontal (or nearly horizontal) shoot applied to the lower part of a cistern delivered the stream on float-boards whose planes were parallel to the axis of the arbor or upright, did not answer so well as was expected, owing in a great measure, it was supposed, to the introduction of a new system, which unless palpably advantageous, is certain to meet with objections from the people to whom the mills are entrusted ; but although the limits of this paper will not allow me to enter into a discussion on the point in question, I am much inclined to consider that the latter method is not only objectionable, but that the power obtained in applying it to this simple water-wheel is much less than the other; a matter to be settled by practical experiments, and not by theoretical speculations. Belidor, in speaking of a mill of this description, says, " En Provence et dans une bonne partie du Dauphiné, les moulins y sont d'une grande simplicité, n'ayant qu'une roue horizontale, de 6 ou 7 pieds de diametre, dont les aubes sont faites en *cuillerès** pour recevoir le choc de l'eau, qui coule ordinairement dans un auge ; L'arbre, qui repond à la meule supérieure, est la seule piece qui sert á lui communiquer le mouvement, et je ne crois pas qu'il soit possible de faire un moulin à moindre frais; il est vrai qu'il faut pouvoir menager une chute comme celle que l'on voit ici, et qui sont tres frequentes dans ce pays là.

" La roue tourne sur un pivot dans une crapaudine pratiquée au milieu de l'entretoise du chassis, servant à approcher les deux meules, par le moyer de la vis se qui est a l'extremité de la piece, et de l'ecrou, que l'on fait tourner pour hausser ou baissir le chassis.

" Les roues que l'on voit exécutées danse la gont de cell ci ont leur cuillères simplement assemblées a l'arbre par un tenon et une cheville,

* These cuillères, or spoon-shaped ends, are mere indentations in the native mills, and the trough alluded to by Belidor for the delivery of the water at an angle of about 25° is in the native mills a square tube or shoot placed at an angle of 45°. The crapaudine and the arrangement for raising or depressing the upper stone by the transom in which it is fixed, is also practised in the native mill.

fortifiées par le dessous par des membrures qui les entretiennent toutes ensembles." He goes on to explain a method of opening and shutting the water-course or shoot, which is of no consequence here. It will be seen however, that this mill is exactly on the same plan as that used in this part of India, and it is a pity that the account did not proceed and explain the powers of the mill, that we might draw a comparison. It would also be interesting to know whether the increased size (the Provence mill being about double the size in diameter of water-wheel, &c.) would not detract from the simplicity of the little native mill; for the great advantage of the latter appears to be the absence of complicated wood and iron-work, especially joints and iron bindings, &c. all of which increase with length of lever, or length of radii of the water-wheel: indeed the above account shews a complication of *membrures*, &c. which in the native mill are not thought of.

Northern Doab, April 30, 1833.

Reference to Plate XII.

Fig. 1. Elevation of the water-wheel, with the stones in section to represent the iron spindle.

At *x*, a hole of about 4 inches diameter and 4 inches deep is made in the transom, into which a quartz boulder is firmly fixed; the said stone or boulder having an indentation made in it to receive the pivot.

This pivot, as represented in fig. 4, consists of another stone of the same quality of about 4 or 5 inches long and 1 inch square, which is firmly fixed into the tail of the arbor, (see *y*.) The above stones are picked up in the beds of the mountain rivers, and are used as they are found without any stone cutting.

Fig. 2. Plan of water-wheel, 30 float boards of sissú wood.

Fig. 3. Upper joint of arbor.

Fig. 4. Lower joint of ditto, shewing the iron straps fixed between each float board, to keep them firmly in position, the strap represented in fig. 5.

Fig. 5. Strap as above.

Figs. 6 and 7. Float board and end of ditto; the float board 12 inches long, with a spoon sunk 4 inches.

Fig. 8. Iron ring that slips over the top of arbor, and holds the two joints together.

Figs. 9 and 10. The spindle and plate upon which the upper mill-stone turns.

Fig. 11. Sketch of mill stones with basket stand, &c.

a. Hopper or basket.

b. Shoe.

c. Feeder, or small piece of wood hanging to one lip of the shoe, and resting on the mill-stone, each revolution of which gives the shoe a jog, causing the corn to run constantly from the hopper through the shoe.

d. String attached to the opposite lip of the shoe, to which the feeder is, and by tightening or loosening which, the discharge of corn is regulated.

e. Stand.

Fi. 12. Shoe on a large scale: this is generally cut out of a block of *dak* (Buteâ frondosa), or any wood easily worked.

SKETCH of WATER MILL for grinding Corn, as used in the Northern Doab.

fig 1.

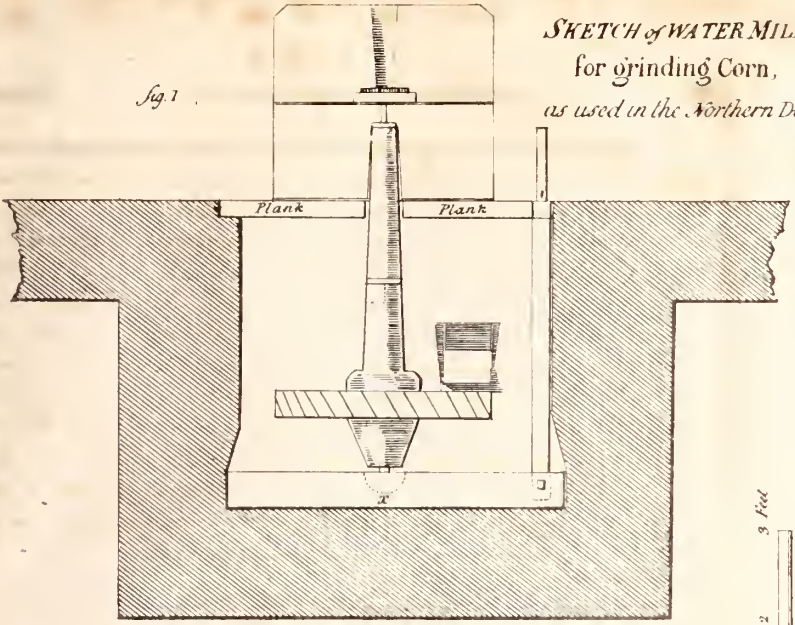


fig 2.

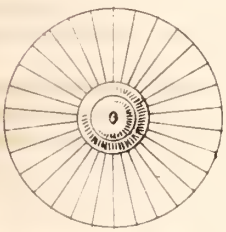


fig 3.

fig 9

fig 10.

fig 8.

fig 4

fig 5

fig 6 & 7

fig 11. Scale. ½ Inch to 1 Foot.

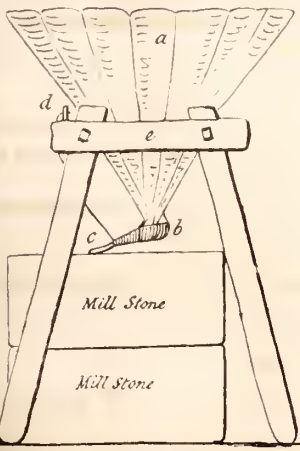
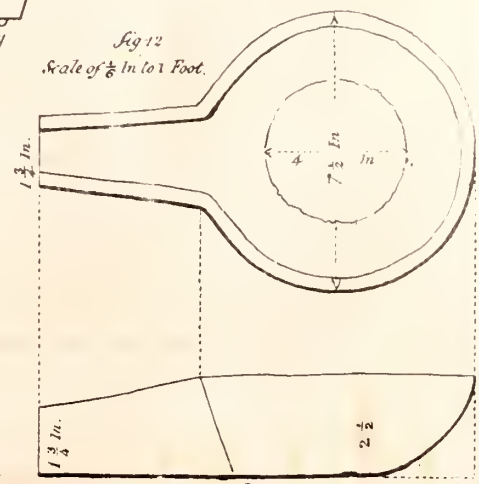


fig 12
Scale of ⅛ In to 1 Foot.



III.—*Description of the Salt Works at Panchpadder, in Márwár. By Lieutenant* A. Burnes, *Bombay Army.*

At *Panchpadder*, in *Márwár*, about six miles north of the river *Súní*, there are extensive salt works under the *Jodhpur* Government, yielding to it annually considerable revenue, in a cent. per cent. tax. The tract which furnishes the salt is a spacious saline plain, about 12 miles long and six broad, commencing three or four miles westward of the town of *Panchpadder*, and hemmed in all other sides by the sand hills of the desert.

In this space there are about seven hundred salterns, each of which is 200 feet long, by 60 broad, with a depth of 12 feet. Within this space the water, which is saline, rises from the soil to a height of four or five feet; and a jungle shrub, called *Marúrí*, is carefully disposed in layers under and over it. To these the saline particles adhere and crystallize, and in the course of two years the whole depth of liquid becomes a mass of salt, the process of crystallization commencing from the bottom.

The shrub which is so essential to this process is of a grey or ashen colour, and grows in abundance on the sand hills of the *Thar* or desert. It must possess certain properties to adapt it for the purpose. In appearance it is like the *Babúl* with thorns, but no other shrub is so suited to the manufacture of salt as *Marúrí*. *Lawn*, or *laan*, a low stunted bush, like evergreen, which is always to be found in salt and level plains, is sometimes used in its stead, but the salt is then of an inferior description. The natives say, that *Marúrí* is a salt plant: it does not appear so to the taste. The fact of *lawn* serving however indifferently as a substitute for it, shews that it must be of a saline quality; for that shrub when burnt yields abundance of alkali, and never grows, but in soils impregnated with salt. The salt manufactured at *Pokran*, *Phalód*, and *Sámbar*, places in *Márwár*, is by a different process from what is here described, and I conclude that the use of the *Múrarí* bush is peculiar to *Panchpadder*. The salt manufactured here is said to be of a superior quality, and is exported to *Malwa*, *Meywar*, &c.

The whole operation of the manufacture is tedious and expensive; the price of the labour is high, from the unhealthy and disagreeable nature of the work. A saltern costs in digging from one to two thousand rupees, and only affords a return every third year, and each successive supply from it is of an inferior description. Of the seven hundred salterns, sixty or seventy might produce annually much more, but this supply satisfies the demand. Each yields on an average about 3000 bullocks, or 8000 *man* of 40 *sír*, of the material. The salterns become unfit for use after thirty or forty repetitions of the process;

they are sometimes recovered by being allowed to lie waste for a few years, and then spreading salt over the bottom of the pits; but the crystals in such cases are always small, and the salt is esteemed good or bad according to their size. When a saltern is to be again used, after the salt has been drawn from it, it is thoroughly cleared out. When the water which springs up anew from the soil begins to gurgle and shew on its surface an appearance as if rain were falling, it is time to throw in the *Marúrí*, which is carefully distributed in all places. Twenty cart loads are sufficient for a saltern.

The cold season is most favourable for the process, but crystallization goes on in the hot weather also, nor does the rain in any way injure it, indeed, it is said to favour it, though no rain water is admitted, but what falls from the clouds on the surface. The inferiority of a saltern is discovered by the quantity of water left on the surface after the period for taking out the salt has elapsed: when such is the case, it is drawn off, and the salt removed.

In forming the salterns it is a custom to sink them some depth into the consistent soil, for the first six feet is little else than sand, but the white effloresence over it, and all the earth which is removed, shews that it is equally mixed with saline particles.

These salt works are entirely worked by a tribe of people resident at *Panchpadder*, of the *Kherewál* caste; and the *Jodhpur* Government does not interfere, but to take its tax. At present, 1830, the *Kherewál* are engaged in sinking about 30 new salterns; the salt of *Panchpadder* having of late years deteriorated from want of better management.

The scarcity of fresh water in the vicinity of these works prevents a greater quantity of salt being exported, for cattle cannot approach them after the tank or rain water fails, about March; and the inhabitants of the surrounding villages are driven to rely on the *Súní*, from which this necessary of life is brought in carts.

There is a temple of a goddess near these salt works, and to the influence of this lady, the people entirely attribute the formation of the salt and the original discovery of it. This has given SAMRA DEVI', (for that is her name,) much celebrity, as may be imagined, where, besides the *Kherewáls*, upwards of a thousand labourers are kept in constant employ.

The *Chárans*, a religious sect who enjoy many immunities, are the principal purchasers of the salt of *Panchpadder*. The article is sold by bullock loads, and not by weight; and it is amusing enough to see the poor animals walking under a *double* load, that their masters may *double* the Government, and escape a portion of the taxation; for on passing the Government toll at the town, they divide the salt into smaller loads.

IV.—*Proceedings of the Asiatic Society.*

Wednesday Evening, the 31st July, 1833.

The Hon'ble Sir Edward Ryan, President, in the Chair.

The Proceedings of the last Meeting were read.

Captain C. M. Wade, Political Agent at Lúdiána, proposed at the last Meeting, was elected a Member of the Society.

Dr. J. T. Pearson was elected Curator of the Society's Museum of Natural History.

The Secretary submitted the Report of the Committee appointed on the 27th March, regarding the continuance of the Boring Experiment [see below] which was read, and it was *resolved*, that the Society adopt the Report of the Committee, and direct it be forwarded to Government, in reply to the communication from Major Benson, Mil. Sec., &c.

The Secretary reported the completion of the second part of the 18th volume of the Asiatic Researches, or *Transactions of the Physical Class*, and submitted a bill from the Military Orphan Press, for Rupees 1962, being the expence incurred in its publication.

Resolved, that the bill be discharged from the fund invested in Government Securities, and that the usual distribution of copies be made.

Mr. A. Csoma de Koros' Manuscript Abstract of the Contents of the Kahgyur, and his comparative Index of Tibetan and Sanskrit Proper Names and Titles, as arranged by the pandits and Tibetan *lotsávas* (translators), when compiling the sacred books of the Shakya faith, in the Tibetan language, having been brought again to the notice of the Society, it was *resolved* to refer them to the Committee of papers, to determine on the expediency of making them over to the Local Committee of Oriental Translation Fund, with a recommendation for their early transmission to England for publication through that channel.

Library.

The following books were presented:

Journal Asiatique, Nos. 57, 59, 60, 61—*By the As. Soc. of Paris.*

The third series of J. Prinsep's Lithographic Illustrations of Benares—*By the Author.*

A Meteorological Register for the first six months of 1833, kept at Kyook Phyoo—*By Colonel W. H. Wood.*

Calcutta Meteorological Register for June—*By the Surveyor General.*

The following, received from the Booksellers:

Lardner's Cabinet Cyclopedia, Spain and Portugal, vol. 5.

Lardner's Treatise on Heat.

Museum.

A note was read from M. S. Bramley, Esq. presenting for the Society's Museum the following articles procured by him in Nipal.

A Chinese map of the Celestial Empire.

A map of his imperial Majesty's Durbar.

Nipalese musical instruments, curiously fashioned like snakes and dragons.

3 Horns called in Hindi "*Bhorang.*"

1 Bass Horn of copper, called *Singha;* (Beng. *Bhanh.*)

3 Hautboys or *Sanáis.*

Some Saligram Stones.

Some brass and copper images. DURGA (Singh-bahni); LOKA-NA'THA, with four hands: and GOUTAMA, or *Sakya-singh.*

Two cast leaden Shrines of Budhist images.

Two bells used in worship, *Ghantí.*

Model of a Budhist Temple, the *Chaitya*, or *Deva-pátana.*

Doctor Bramley's series of Nipalese Coins was also exhibited, and a paper in illustration of them by the same gentleman was read.

A letter was read from Raja Kalí Kishen Behadúr, presenting a model of a simple instrument on the principle of the steel yard used by the natives for weighing, called a "*toolah,*" with a description of its use.

A box was exhibited by the Secretary, containing twelve Roman copper Coins, in fine preservation, procured from a friend by the late Mr. JAMES MACKINTOSH at Buxar, and stated to have been found buried in Upper India. The collection comprises coins of Domitianus, Gordianus, Gallienus, Salonina his wife, Posthumus, Victorinus, Claudius Gothicus, Tacitus, Probus, Maximianus, Constantinus, and Theodosius: the latest belonging to the fourth century of the Christian era.

Sealing-wax and paper impressions were also exhibited of some of the most rare of Dr. SWINEY's collection of coins.

Physical.

Specimens of Coal, lately discovered in the Arracan district at *Oogadong Synegkhyong,* were presented in the name of Lieutenant W. FOLEY, Sub-Assistant Commissary General at Kyook Phyoo.

The specimens were necessarily small, having been transmitted by dâk. The coal of Oogadong appears of a fine quality, burning with much flame, and forming a tolerable coke; it contains veins and nodules of iron pyrites, of which specimens were sent, as also of the shale in the vicinity of the coal beds.

The specific gravity of this coal was 1.259. An analysis of 20 grains gave—

Volatile matter,	38.0
Carbon,	54.5
White ash,	7.5
	100.0

The Synegkhyong coal has a fine glossy lustre, resembling jet; it is hard and brittle: contains veins of a white earth (decomposed pyrites ?)—spec. grav. 1.368. 8 grains gave on analysis,

Volatile matter,	29.0
Carbon,	67.0
White ash,	4.0
	100.0

Lieutenant FOLEY states that these specimens are merely from the surface, and that he did not possess the means of ascertaining the depth of the strata, but the appearances of the crop were highly favorable. "The stratum in which the coal of *Oogadong* was discovered was composed of—

1 Bituminous shale.
2 Coal, with clay and pyrites.
3 Claystone.

Were this claystone bored through, another and richer vein would probably be found. The mineral appeared abundant in such places as were excavated; the coal vein varying in thickness from six inches to a foot: the dip very great, or at an angle of 70°."

Lieut. F. imagines that tin and copper may be contained in the ores; but no signs of either metal were found in the specimens transmitted. Another deposit of coal is mentioned at Kalabadong; thus making four localities (with that from Kingtellie, vide page 264), already discovered in that district.

The Secretary notified the safe arrival of the specimens of *Rániga[illegible]* vegetable impressions from Dr. H. Falconer, Superintendent H. C. Bot. Gard. Seharanpur.

Accurate drawings have been made of these interesting reliques, in illustration of a catalogue of them in preparation by Doctor Falconer.

The Society adjourned its next Meeting to the last Wednesday in the month of October.

V.—*Report of the Committee appointed on the 27th March,* 1833, *to consider on the expediency of recommending to the Government the continuance of the Boring Experiment.*

The questions submitted to our consideration are presented under the four following heads:

1st. The probability of ultimately finding a spring of fresh water.

2nd. The expediency of making any further attempt.

3rd. The mode of avoiding such accidents as have hitherto impeded the descent of the boring instrument; and

4th. The estimated expence.

We will endeavour to pursue the subject in the same order in our present report, referring for further detail to the annexed minutes of those of our members whose practical acquaintance with engineering operations has enabled them in a great measure to guide our judgment.

1. The principal experiments on record, connected with the operation of boring for water in Calcutta, are those conducted under Colonel Garstin, Chief Engineer, from 1805 to 1820, and those recently made under the superintendence of Dr. Strong, Mr. J. Kyd, and Mr. D. Ross, in 1829 to 1833. The following is a list of their localities and of the depths respectively attained*:

* Vide Gleanings, i. 114, or 167; iii. 124, 422, &c. also As. Res. 1814.

No.	*Date.*	*Superintendant.*	*Place.*	*Depth.*	*Cause of failure.*
1	1804, Dec.	Col. Garstin,	Well near Powder Mag.	75 ft.	
2	1805, Aug.	ditto,	S. W. of Artillery Barrack,	119	auger broke.
3	Sept.	ditto,	S. E. of Regimental Parade,	55	ditto.
4	Oct.	ditto,	S. E. of European Barrack,	59	ditto.
5	Nov.	ditto,	S. W. of Artillery Parade,	80	ditto.
6	Dec.	ditto,	ditto	127	ditto.
7	1806, Feb.	ditto,	ditto	94	ditto.
8	Mar.	ditto,	ditto	124	earth fell in.
9	Apl.	ditto,	same operation resumed,	127	auger broke.
10	1814, May,	ditto,	S. E. of Artillery Parade,	140	suspended by rains
11	Nov.	ditto,	the same renewed,	136	auger broke.
12	1819, May,	ditto,	on Artillery Parade,	130	ditto.
13	1820, Apl.	ditto,	ditto	122½	ditto.
14	May,	ditto,	Near triangular barrack,	128	earth fell in.
15	1815,	Mr. Jones found a spring in red sand at		70	feet.
16	1826-8,	Dr. Strong, bored in the Circular Canal to		70	water rose.
17		he also made several borings in the S. W. lake to		40	thro' similar strata.
18		Dr. Strong	near the Circular Road,	70	hard kankar.
19		ditto	at Rasapugla,	70	sand fell in.
20	1830,	Strong, Ross, and Kyd,	near the Fort church,	176	shaft injured.
21	1832,	ditto,	near St. George's Gate,	164	sand fell in.
22	1833,	ditto, ditto,		170	auger broke.
23	1832,	Dr. Strong,	under the Lock Gates, Chitpore,	70	water sprang up.

The *geological* question of the probability of finding a spring is by no means solved by the results of these numerous experiments. The knowledge which they afford us of the nature of the Calcutta alluvium may be summed up in very few words:—(See Plate XIII.)

After penetrating through the artificial soil of the surface, a light blue or grey-coloured sandy clay occurs, becoming gradually darker, as we descend, from impregnation with decayed vegetable matter, until it passes into a stratum of black peat, about two feet in thickness, at a depth in Fort William, of 50 feet below the surface. In excavating the Circular Canal, the same stratum of peat occurred at from 25 to 30 feet; and in the Entallee Canal, it lay just below the bed, or nine feet below the average level of the salt-water lake.

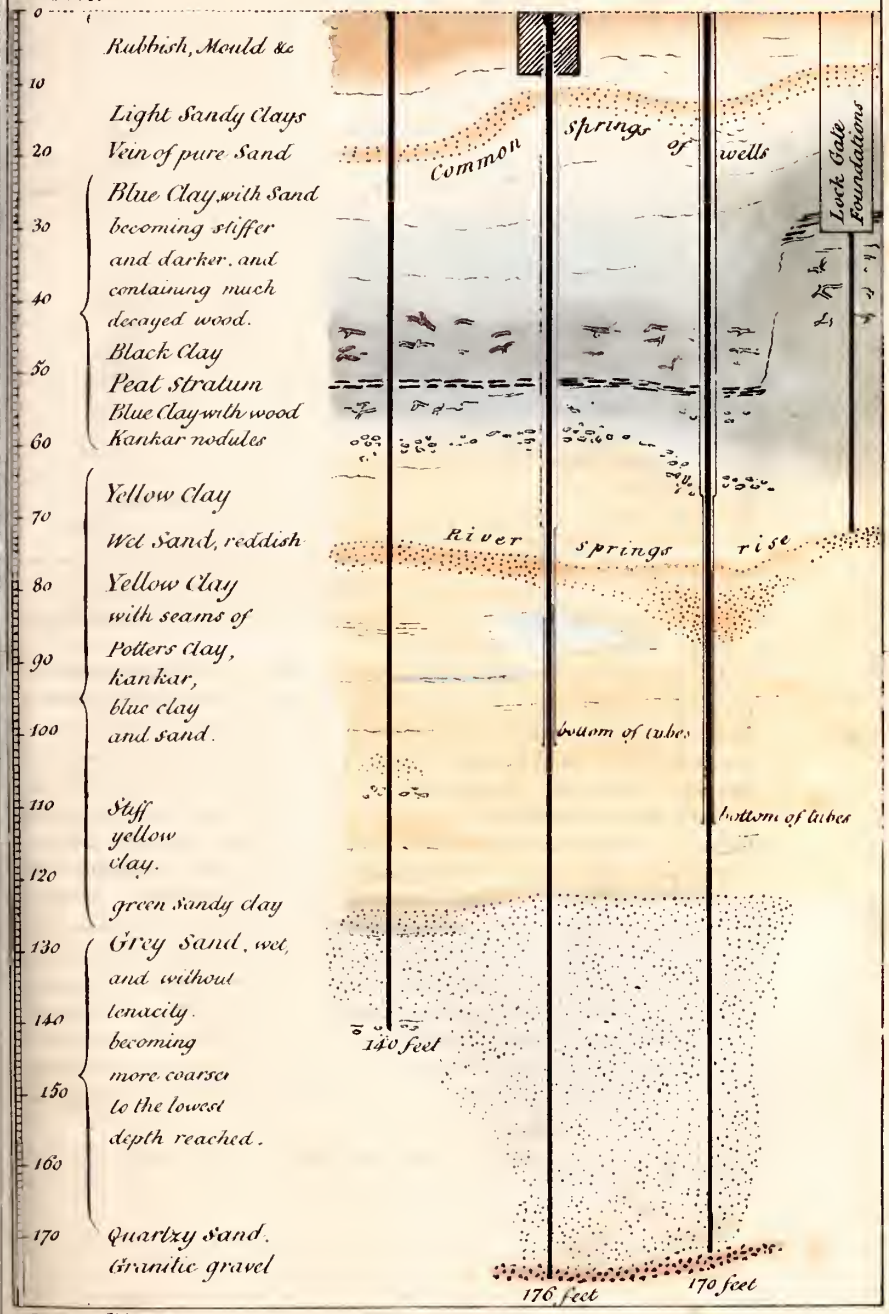
This peat stratum has all the appearance of having been formed by the debris of *Sundarban* vegetation, once on the surface of the Delta, but gradually lowered by the compression of the sandy strata below. Assuming that the salt-water lake is five feet above the average height of the ocean, the peat stratum is about as much more below the present level of the sea.

In the grey or black clay above, and immediately below, the peat, logs and branches of a red* and of a yellow wood† are found imbedded, in a more or less decayed state. In only one instance have bones have been met with, (at 28 feet), and they appear from the report of the workmen to belong to

* The common Súndri of the Sundarbans.

† The root of some climbing tree, resembling the Briedelia. N. WALLICH.

Section of the Strata of Alluvium at Calcutta



J B Tassin lith.

deer, though they were unfortunately lost before examination. A stratum of sand occurs generally above the peat clay at from 15 to 30 feet deep, from which the wells in the town are chiefly supplied with brackish water.

Under the blue clays at from 50 to 70 feet deep, the nodular limestone concretions, known by the name of *kankar*, occur, sometimes in small grains (called *bajrí* in Upper India) with the appearance of small land shells; sometimes in thin strata of great hardness, and sometimes in the usual nodular shape.

At 70 feet occurs a second seam of loose reddish sand, which yields water plentifully. It was reached also in the perforation under the Lock Gates at Chitpore, and there (as Mr. Jones had previously asserted from his own experiment across the river), the supply was proved to be derived direct from the river.

From 75 to 125 feet, beds of yellow clay predominate, frequently stiff and pure, like potter's clay, but generally mixed with sand and mica. Horizontal seams of kankar also run through it, resembling exactly those of Midnapur or of the Gangetic bason.

Below 128 feet a more sandy yellow clay prevails, which gradually changes to a grey loose sand, extending to the lowest depth yet penetrated; and becoming coarser in quality until at 170—176 feet, it may rather be termed a quartzy gravel, containing angular fragments of quartz and felspar larger than peas, such as are met with near the foot of a granitic range of hills.

This stratum has hitherto arrested the progress of the auger; the greatest depth attained by Dr. Strong near St. Peter's Church being 176 feet.

The evidence of this gravel might tend to prove that the auger had here penetrated through the bed of alluvium of the Gangetic delta; while the sandy texture of the undermost layers might be compared to the probable condition of the deposits under the now advanced head of the bay, not yet reached by the more easily suspended particles of clay, nor consolidated by vegetable matter, like the tenacious black mud of the *Sundarban* creeks.

Nevertheless, we must be cautious in forming any such conclusions upon slight premises, remembering that Colonel Garstin more than once, concluded from similar appearances that he had reached the *rock* at 130 feet. Beneath the quartzy sand may possibly occur another deep stratum of tenacious clay, and upon piercing every such stratum, and touching a seam of sand under it, the chance offers of succeeding in the object of our search.

It is true that the horizontality of the delta alluvium, and its close neighbourhood to the ocean, afford arguments against the probability of finding an *artesian* spring upon the hypothesis of Hericart de Thury*, that is, of basons and curved or sloping strata,—which is generally adopted as affording the best explanation of the phenomena of such springs: but in face of the successful borings in Holland, and in many other flat and alluvial countries, nay even in insular situations, it would be hazardous even in a

* See Gleanings, iii. 10.

geologist to predict want of success in Bengal, unless he was well assured that the rocks under the alluvium were of the granitic or unstratified class.

The depth yet attained is very trifling, and we all concur in thinking that the experiment should not be relinquished, until the ground has been pierced at least to the depth of 500 feet. Borings in Europe seem seldom to have been undertaken upon purely scientific principles or expectations; sometimes they have started in direct opposition to them, and yet obstinate perseverance has frequently been crowned with success: so may it be in India. While drawing up our report, we hear of the eminent good fortune which has attended Lieut. FULLJAME's attempts in *Guzerát*, at *Ahmedábad**, where water rushed up with great force through the tubes to the astonishment of the inexperienced in such matters. The soil of the plains in *Guzerát* is so sandy and unretentive of moisture, that most of the wells have a depth exceeding 100 feet. But we have not sufficient knowledge of the country to draw any deductions applicable to our own position in Bengal.

2. In reply then to the second query, we are of opinion that it is by all means expedient to continue the boring, and were the Society in a condition to afford the funds necessary, we should be sorry to see the honor of its superintendence transferred to other hands.

3. The accidents which have hitherto impeded the progress of the auger below 175 feet, are entirely attributable to the falling in of the lower sandy stratum, an increasing difficulty against which no sufficient remedy has been provided. All perseverance in boring, as long as this impediment exists, or is not counteracted, has been, and will be, an absolute throwing away of money and time.

The remedy always adopted in such cases of bad soil at home consists in lining the perforated hole with copper or cast iron tubes well united with spigot and faucet joints.

It is therefore indispensable that these articles be provided before the boring can proceed or be renewed. The tubes may either be supplied from England, or now that the casting of iron is practised in India, they may be made here: the expence however in the latter case is estimated by one of our members at full double the English cost, and there is a chance of failure in the texture of the metal from the want of raw material to fuse with the fragments of old cast iron of which the fount usually consists in India. It seems therefore preferable to commission the tubes at once from England†, giving the manufacturers every information regarding the nature of the soil and the depth, that they may adapt the most convenient lengths to the tubes of the different grades and sizes. At the same time, any new tools or apparatus for facilitating the operation may be commissioned out.

* The boring was commenced at the bottom of an abandoned well.

† We understand that a large supply of cast-iron tubes and boring rods was brought out for Madras by the H. C. S. Buckinghamshire this season.—ED.

There is no reason, however, why trials should not be made meanwhile at the Government foundery, to model and cast some of the tubes, as, if successful, there would be ample employment for them in various parts of India. Much of the delay experienced in the latter borings has been attributed to the shortness of the jointed rods, and the necessity of unscrewing them so often. It has occupied, on an average, five hours to lift 170 feet of rod, and the daily progress at that depth has consequently been seldom more than a foot: although a gradual improvement has taken place with the growing experience of the workmen. Thus to bore the first shaft of 175 feet, consumed two years: the second of 164 feet was completed in one year, and the third, of 170 feet, in less than six months. Colonel Garstin's operations seem to have been much more rapid, but the time, it must be remembered, augments in a geometrical ratio with the depth. That officer had, further, a more efficient establishment at his command.

A new set of stronger and longer boring rods might facilitate operations, but these and all such other details may safely be left to the discretion of an experienced Superintendent, such as Serjeant Reid, whose ingenuity will supply expedients as accidents may occur to necessitate them.

Should the Government undertake the experiment, it may perhaps be deemed of sufficient importance by the Honorable the Court of Directors, to send out engineers especially versant in the art of boring the earth. At any rate we venture to suggest the advantage of having all men, intended for their Sapper and Miner service, instructed in the practical part of the operation as a part of their professional education at Chatham.

With all these precautions, we do not anticipate the recurrence of any further insurmountable impediments to the auger, until it may reach the actual rock.

4. With regard to the expence of a new experiment, we have been informed that six hundred feet of tube may be provided for less than £150. The Society has expended on three protracted operations, including the cost of wrought iron tubes, &c. about Rupees 3,000. We cannot therefore estimate that one steady experiment, tubes included, will cost so much as these three unsuccessful attempts. And in the hands of a Government, which has the power of deputing its own officers and men to conduct the work on duty, nothing beyond the small contingencies for repairs of rods, wear and tear of ropes, &c. can properly be set down to the charge of the experiment.

Should nothing further be elicited after penetrating 500 feet, or even "to the rock," than the knowledge, that a spring of fresh water is not thus procurable, it will in our opinion be knowledge cheaply bought; and although geological research is not to be put on a par with the direct and political object of providing wholesome water to the garrison of Fort William, still an acquaintance with the depth, variety, and nature of the alluvial deposits, which separate us from the rocky crust of the globe, and of the coincidence of the subjacent strata with some of the rocks which have been developed to our view above ground, by geological or physical causes, cannot but prove

interesting to the Government, to the scientific world, and to mankind in general.

(Signed,) W. H. MILL, D. D. *V. P.*
W. N. FORBES, *Capt. Engineers.*
J. M. SEPPINGS.
J. LANGSTAFF.
Asiatic Society's Apartments, J. N. CASANOVA, M. D.
20th July, 1833. N. WALLICH, M. D.

VI.—*Miscellaneous.*

Remarks on Hutton's Mathematics.

To the Editor of the Asiatic Journal.

SIR,

I observe occasional strictures on mathematical and physical works in the miscellaneous department of the Journal : I am therefore induced to send you the following observations on some passages in Dr. HUTTON's Course, which if not inconsistent with your plan you may perhaps find a place for.

The first subject of remark is the Doctor's method of treating the hyperbola in his conic sections*. Here he appears to have made it too much his object to point out the strong analogy which subsists between it and the ellipse, which is indeed both striking and interesting ; but in keeping to this one point he has sometimes gone too much on the general idea, and has not attended sufficiently to the specific properties of the curve in question, giving his demonstrations in the same words for both these sections of the cone, in one or two instances, where the correspondence was scarcely close enough to admit of this method of procedure.

To come to particulars. In Prop. I. the squares of the ordinates are proved to be to each other as the rectangles of the abscisses, but only be it observed in regard to the *primary* curve. In Prop. II. Dr. H. comes to shew that the square of the transverse is to the square of the conjugate as the rectangle of the abscisses to the square of their ordinate ; but his first step consists in assuming the semi-conjugate to be an ordinate to the curve. Now this I contend is premature, for of the conjugate hyperbola nothing has yet been said, but that it exists, and this in the definitions only.

The difficulty might perhaps have been evaded by adding after Prop. I. something similar to the following : SCHOLIUM. " The above proposition, as the reader will observe, is identical with Prop. I. of the ellipse, but the analogy between the curves is yet closer than these corresponding properties of the abscisses and ordinates would at first sight suggest ; for if, as in the ellipse, the square of the axis A B is made to the square of another line passing through the bisecting point at right angles to A B, and bisected by A B, as the rectangle under the abscisses of an ordinate to the square of that ordinate, it will be a conjugate axis to A B corresponding to the conjugate axis of the ellipse, through which conjugate curves passing complete a conformity between these two sections of the cone, which is very close and remarkable."

From Prop. II. all goes on with apparent smoothness till Theor. X, where in proving that the parallelograms inscribed between four conjugate hyperbolas

* See on this head T.'s paper in GLEANINGS, iii. p. 161, 213.—ED.

are equal to each other, and to the rectangle of the two axes, it is assumed that in Prop. VII. it had been shewn, that if a tangent and ordinate be drawn from any point in the curve meeting the transverse axis, the semi-transverse will be a mean proportional between the distances of the said intersection from the centre, whether the curve be the one cutting the said transverse or its conjugate, whereas it has only been shewn in the former case. There is to be sure no great difficulty attending the demonstration of the latter case, when the former is given; but still it is an obstacle every reader will not take the trouble to master, nor perhaps every teacher be at the pains to make his pupil overcome.

I will only add one other remark at present, and that on a subject closely connected with what precedes. In the demonstration of the problem of the trisection of an arc, vol. III. p. 217 a step has been omitted. It follows from Cor. Theor. 2 that in the equilateral hyperbola the rectangle of the abscisses is equal to the square of the ordinate, and after a short deduction by Theor. 18 "to $K \cdot KI = AK^2$." the last reference has not been given.

Tirhoot, 19th June. L. D.

2.—*The Royal Society.*

The annual address of the Duke of Sussex to the Royal Society* evinces a real desire on the part of the Royal President to identify himself in its interests, and to awaken a new and *reforming* spirit in this veteran establishment, which has of late years exhibited rather more indulgence in the election of its members, and the selection of its papers for publication, than was consistent with the dignity of *la haute science.* The council it seems have taken the hint of Mr. Babbage to submit every paper to a Committee previous even to its being read. We have before remarked†, that the custom of the Academies of Science and Medicine at Paris, of requiring such written reports, has produced a collection of essays on all subjects in general more valuable than the original communications upon which they are founded, because the persons who are selected as Committee men are "veterans in their respective sciences, who have earned by their labours an European reputation." The class of *savans* however to which these duties are entrusted in Paris is nearly wanting in England, where the Members are not supported by Government pensions, and there are few private professorships in which the *otium* of dignified retirement can be devoted to such objects; while for the rich amateur or the laborious practitioner the task would be alike unwelcome and unsuitable. The President however is satisfied that qualified men will be found ready to sacrifice both time and labour, out of their sympathy for the scientific honour of their country. We hope to find these expectations realized in respect to the Royal Society; and we would suggest that the plan of reports on papers should be introduced in our own society: the reports will be more useful here to shew upon what studies our members are engaged, because so long an interval generally ensues before their original papers are doomed to see the light.

The obituary catalogue of the past year is heavily charged. Sir Everard Home, the author of 107 papers on comparative anatomy in the Transactions; Sir James Hall, the *experimental* supporter of submarine volcanic agency; Groombridge, the

* Printed in the Phil. Mag. Feb. 1833.

† Vol. i. p. 367.

astronomer; LESLIE, the chemist (not a F. R. S.)* ; of foreign members, the great CUVIER ; CHAPTAL ; the Baron de ZACH, and B. ORIANI, astronomers ; Ant. SCARPA, the anatomist, have all bequeathed their illustrious names to science. Sir JAMES MACKINTOSH and Colonel MARK WILKS, we may in some measure lay claim to ; the former was for eight years Recorder of Bombay, the latter is known for his Researches on the History of Mysore : let our readers reflect upon the advantages which the PRESIDENT supposes them to possess from their Indian training.

" Colonel WILKS must be considered as one of those distinguished men who have been formed by the system of our Indian Empire. The possession of great commands, upon which the happiness and misery of considerable nations are dependent, and the intense feeling of responsibility, which is connected with the administration of trusts so important, is well calculated, under all circumstances, to call forth into action the highest powers of the human mind ; and particularly so, when they have been previously exercised and fortified, as in our Indian service, by the severe study of oriental languages, and by the successive occupation of different offices, with a great diversity of duties : it is to such causes that we are to attribute the frequent union which we observe in this service of the greatest civil and military talents with the most profound acquisitions in oriental learning ; it is to this system that we are indebted for the production of a DUNCAN and a MUNRO, an ELPHINSTONE and a RAFFLES, a COLEBROOKE and a MALCOLM, and a crowd of great men who have done so much honour to our Indian Government."

At the conclusion of his address, the President alludes to the precarious position of Captain Ross and his companions. It is more than three years since he started on his forlorn expediton, to retrieve the glory which he considered had been shorn from him by the greater success of others in the exploration of the Polar Sea ; and no tidings have been yet received of him. A vessel is now preparing, under the auspices of the Geographical Society, to pursue the supposed track of the party, and if possible relieve the anxiety of their friends and relations with some certain intelligence of their fate.

3.—*Discovery of a Bed of Fossil (Marine ?) Shells on the Table Land of Central India.*

A circumstance which must prove highly interesting to all lovers of geology, has lately been brought to light by the discovery of a bed of fossil shells (marine ?) in a good state of preservation. Accident, as usual, in discoveries of this kind, led to their detection. A well had been sunk some 14 years ago by a native, half a mile distant from Saugor, beside the road leading to Jubbulpore, and with the stones turned out of it, he erected a small hut for his workmen, little dreaming at the time he was piling up such geological treasures. A man the other day, seeing something unusual in a lump of the limestone of which the hut was built, dragged it out, and took it to his master, Mr. Fraser, who immediately recognized it as being a shell. So interesting a fact could not be lost sight of, and means were immediately taken to follow up the discovery. On searching the walls of the dwelling, several other stones equally rich in shells were detected, and the owner of the

* Professor BARRY, Lecturer at GUY'S, fell a victim to the imprudent pursuit of his chemical inquiries, from the explosion of some gases in a highly condensed state, upon which he was experimenting.

ground being questioned; stated, they came out of the well about half way down; but ocular proof was not to be obtained, from the sides of the well being stoned up with large blocks of sandstone. To allow a point of so much interest to remain in doubt would have been highly culpable, and Dr. Spry immediately set about sinking a shaft parallel to the well, that the locale might be effectually set at rest.

After sinking through basalt, both soft and hard, he came, I understand, upon a bed of soft fatty red soil, containing nodules of lime, and presently reached the anxiously sought limestone bed, from which he had the satisfaction of disentombing some rich specimens of shells. The bed is formed exactly 17 feet below the present surface. The shells are univalved of different sizes—some nearly as long as the hand, and all of them are what is termed *reversed* shells*. I understand, however, he is proposing to send an account of them to the Asiatic Society, and I shall not therefore venture to do more than announce the discovery to you.—*Mofussul Ukhbar.*

4.—Indian Zoology.

Extracts from the Proceedings of the Zoological Society, April 10, 1832.

Mr. Gray enumerated the following species of the genus *Paradoxurus*, all of them as far as their *habitat* has been ascertained, natives of India and the Indian Islands.

1. *Paradoxurus Typus.* F. Cuv., Mamm. Lith.
   Genette de France. *Buff., Hist. Nat. Suppl.* iii. t. 47.
   Viverra nigra. *Desm., Mamm.* p. 208.

This species appears to be the *Musk* and *Musky Weasel* of Pennant's Quadrupeds, both taken from Sir Elijah Impey's drawings, but not the *Piloselle Weasel* of the same author, which has hairy soles. There is a variety now living in the Gardens of the Society, which may be called *fuliginosus*, it being nearly black in consequence of the length and number of the black hairs, which only show the fulvous under-fur between their roots. It has a very distinct pale spot above, and another beneath, the eye.

The three following species are only known by the drawings of Dr. Hamilton and Gen. Hardwicke, the former of which were liberally lent to Mr. Gray by Dr. Wilkins and Dr. Horsfield, in order to enable him to determine by actual comparison the species described from them by M. de Blainville. The first two appear to agree with *Par. Typus* in having nearly naked ears, and may possibly be the only varieties of that species; the third approaches more nearly to *Par. Muangas.*

2. Paradoxurus Pennantii. *Par. pallidè cinerascenti-brunneus, fasciis obscuris saturatioribus lateralibus; auriculis nudiusculis; orbitis albidis; artubus caudæque dimidio apicali nigrescentibus.*

This animal is stated by Gen. Hardwicke, from whose drawings the character is taken, to be found in the upper provinces of Bengal, and to be very destructive to poultry and game. Its head and body measure 21, its tail 23,—making a total length of 44 inches. The ears and sides of the nose are pale flesh-coloured.

* The same curious fact is observable in the silicified fossil shells lately presented by Dr. Spilsbury to the Asiatic Society.—Ed.

Ichneumon Bondar. *Ham., MSS.*

3. *Paradoxurus Bondar.*

Viverra Bondar. *Blainv., in Desm. Mamm.* p. 210.

This species inhabits Bengal, where it is called the *Musk-Cat*. Its head and body measure 25, its tail 24,—making a total length of 49 inches. Dr. HAMILTON'S reduced figure, from which this animal was described by M. de BLAINVILLE, agrees with Gen. HARDWICKE'S drawing in almost every particular, except that in the former the nose is rather sharper, and the tail not quite so bushy as in the latter.

4. *Paradoxurus prehensilis.*

Ichneumon prehensilis. *Ham., MSS.*

Viverra prehensilis. *Blanv. in Desm. Mamm.* p. 208.

This species is only known from Dr. HAMILTON'S drawing; it appears distinct from any of the others, more especially in the bands of the sides of the back being formed of oblong nearly confluent spots, and in the length of the tail, which has a long white tip. The central dorsal streak is not very distinctly marked, and the dark line in the drawing may perhaps be intended for the shadow.

5. *Paradoxurus Musanga.*

Viverra Musanga. *Horsf., Zool. Res.* t. 5.

Viverra fasciata. *Desm., Mamm.* p. 209?

The very young animal is pale ash-coloured, with three distinct black dorsal bands, and the sides spotted. Its fur is very close and soft, mixed with scattered very rigid rather longer black hairs.

6. PARADOXURUS DUBIUS. *Par. pallidè flavescenti-cinereus, pilis dorsi longioribus apice brunneis, subtùs flavescenti-albidus; dorso fasciis centralibus tribus, lateribusque maculis brunneis inconspicuis; capite, auriculis pilosis, pedibusque castaneis; caudâ præter imam basin negro-brunneâ: maculæ utrinque adnasum, alterius supra genas, fasciæque interauricularis transversæ pilis albo-apiculatis.*

This species is described from a young specimen sent to the British Museum by Dr. Horsfield: it may be only a variety of *Par. Musanga*, but cannot be the general state of the young of that species, which is described above. It is probably the Javanese variety of the *Musang* described and figured by Dr. Horsfield.

7. *Paradoxurus hermaphroditus.*

Viverra hermaphrodita. *Pallas, in Schreb. Säugth.* p. 426.

The description of the glandular fold between the *anus* and *penis* proves this species, which is only known by Pallas's description, to be a *Paradoxurus*. It appears to resemble the preceding, but differs in having the entire throat black, and in its black dorsal bands.

8. PARADOXURUS PALLASII. *Par. nigrescenti-griseus, nigro alboque intermixtus, infrà pallidior; dorso fasciâ latiusculâ maculisque parvis utrinque biserialibus nigris; artubus, lateribus inferné, caudâque nigrescentibus; facie nigrâ maculâ utrinque ad nasum, alterâ sub oculos, fasciâque transversâ per frontem pone genas ad gulam usque ductâ, albis; auriculis nudiusculis; gulâ anticé, nigrescenti-cinereâ, posticè cinereo-albidâ; caudâ corpore longiore.*

Par. albifrons. *List in Report of Council Zool. Soc.* 1831, *haud F. uv., Mém, Mus.* ix.

This species is described from a living specimen in the Gardens of the Society brought from India, and presented by Mr. Buchanan.

9. Paradoxurus Crossii. *Par. suprà nigrescens, pilis plumbeis nigro-apiculatis, infrà flavescens, pilis albo-apiculatis ; auriculis apice nudiusculis ; facie auriculis externè ad basin, pedibus, caudæque dodrante apicali nigro-brunneis ; maculâ rotundâ palidâ ad nasum utrinque, alteráque minore sub oculos ; fronte flavescente.*

The length of the head and body is 21 inches, of the nose to the front of the ear $3\frac{1}{2}$, of the tail 16, of the fore-foot to the elbow-joint $4\frac{1}{2}$, and the distance from the back of the fore-foot to the front of the hind-, 8 inches. The species is described from a specimen lately living in the Surrey Zoological Gardens, and since presented by Mr. Cross to the British Museum, where both the skin and skeleton are preserved.

10. *Paradoxurus leucopus.* Ogilby, in Zool. Journ. iv. p. 304.

11. Paradoxurus Hamiltonii. *Par. auriculis pilosis ; dorso griseocinerascente-pilis nigro-apiculatis intermixtis, seriebus sex vel septem macularum rotundarum nigrarum ; facie dorso concolore, strigâ angustâ nigrâ inter, alteráque utrinque suprà, oculos ; fasciâ nuchali mediâ nigrâ, laterali utrinque breviore pallidbrunneâ ; pedibus dorso concoloribus ; caudâ corpore sesquilongiore, rufescenti, brunneâ, annulis angustis subæqualibus nigris versus apicem remotioribus.*

This species is described from a living specimen in the Surrey Zoological Gardens, which has been in Mr. Cross's possession about two years.

12. *Paradoxurus larvatus.*

Gulo larvatus. *Ham. Smith, in Griff. An. Kingd.*, ii. p. 281.

Viverra larvata. *Gray, Spic. Zool.* p. 9.

Paguma larvata. *Gray, Proc. Comm. Zool. Soc.* i. p. 96.

13. Paradoxurus trivirgatus. *Par. nigrescenti-griseus, infrà griseus ; capite saturatiore ; dorso fasciis tribus longitudinalibus mediis nigrescentibus ; pedibus caudâque corpore longiore nigris ; fascie immaculatâ.*

Viverra trivirgata. *Reinw., Mus. Leyd.*

This species is described from a specimen, in the Leyden Museum, sent from the Moluccas. The teeth agree with those of the genus in every particular, except that the cheek-teeth are rather shorter.

14. *Paradoxurus ? binotatus.*

Viverra binotata. *Reinw., Gray, Spic. Zool.* p. 9.

Mr. Gray referred this animal to the genus *Paradoxurus* with some doubt, he not having seen the teeth. Its walk, however, is truly plantigrade. The *habitat* of Ashantee, given to it in the Leyden Museum, may be questioned: it was obtained from an old Dutch collection, in which it is possible that the localities were not strictly preserved.

To this enumeration Mr. Gray added the indication of an animal known only by a rough sketch brought by Mr. Finlayson from Siam, and deposited in the Library of the East India Company. This he proposed to call *Paradoxurus Finlaysonii*, and described as being pale-brown ; with a band across the middle of the muzzle, and another across the orbits (including the eyes, and expanding on the back of the cheek), the ears, and three continuous narrow lines along the middle of the back, blackish brown ; the feet blackish ; and the tail cylindrical. He also considered it probable that the *Civette de Malacca* of Sonnerat, *Voy.* t. 91, the *Viverra Malaccensis* of Gmelin belonged to this genus, with which it agreed in several particulars of its mode of colouring, although it differed in having a black

streak along the middle line of its belly, a character confined to few among the *Mammalia*.

With respect to the *Paradoxurus aureus* of M. F. Cuvier, he stated that he was inclined to believe that it really belonged to the genus on account of its naked soles, but was certainly not, as had been imagined, the young of *Par. Typus*.

Mr. Gray added, that figures of the *Parr. Pennantii, Bondar, prehensilis, Pallasi*, and *Hamiltonii*, are engraved for the forthcoming No. of the 'Illustrations of Indian Zoology.'

VII.—Analysis of Books.

Result of Astronomical Observations made at the Hon'ble the East India Company's Observatory at Madras. By Thomas Granville Taylor, *Esq. Astronomer to the Hon'ble Company. Vol. I. for* 1831.

The Madras Observatory has long since established its character, as well for laborious diligence in the proper duties of its professional calling, as for other collateral researches which naturally fall into the hands of a scientific astronomer. Under Mr. Goldingham's superintendence four ponderous foolscap tomes of astronomical observations were given to the public, and one volume of "Papers" containing miscellaneous matter of great interest.

From the imperfection of the instruments then attached to the establishment, (a 20-inch transit instrument, a 12-inch altitude instrument, and a zenith sector,) the astronomical results were not of a class to satisfy expectations in the present advanced state of that science. In other investigations Mr. Goldingham's name will be long quoted as of paramount authority. His pendulum experiments at Madras, and on the equator, are of the highest value: his determination of the velocity of sound under different pressures, temperatures, and directions of the wind, from a very long series of experiments, is most conclusive and satisfactory: and his meteorological series for 21 years, although unfortunate in the hours selected for the Barometer, contains abundant means of fixing the curves of temperature and pressure for the latitude of Madras.

But the present volume (printed also in a better form and type), is the commencement of a new and purely astronomical series. We may date the regeneration of the Madras establishment from the year 1830, when a 5-feet transit instrument, a 4-feet mural circle, and a 5-feet telescope equatorially mounted, which had sometime previously arrived from England, all made expressly for the observatory, were set up for use upon a solid and insulated basement of masonry, 45 feet long and 12 feet broad, tapering to 6 at top, and 7 feet high.

With every particular of the adjustment of the new instruments, Mr. Taylor makes us fully acquainted: the setting up and the error of the meridian mark: the errors of level, of collimation, of azimuth, and of the clock, for every day of the year; and the formula applied in each case for the necessary corrections. Mr. Taylor is so far of the *French school* that he prefers computing the corrections due to each observation rather than attempting to avoid them by contiuual adjustment of the screws of his instruments, and in this practical maxim we concur with him from experience; the more immovable the standing parts of an instrument remain, the more consistent and even will the observations be found.

The results of our astronomer's labour are not only most creditable to himself, but they prove how much may be effected by steady, well-instructed native assistants; for during the six months of Mr. TAYLOR'S deputation to Calcutta, to assist in measuring the Barrackpúr Base, for the great Trigonometrical Survey, the four pundits attached to the observatory had entire possession of the transit, the mural, and the Satellite telescope, and very few cases occur in which there is room to note "*unaccountable*," against an entry in the register: at first only some malicious intruder was constantly giving annoyance by breaking the cross wires of the transit, as if to try the patience of the new master.

In all computations of results, the observatory itself is made to furnish the data; this also is a proper rule, for the climate, temperature, or clearness of the air have influences on refraction, and irradiation, which should not be trusted to estimated values. Thus, our author finds the mean diameter of the sun 16′ 0″·15, differing (how much?) from European determinations. The effects of irradiation are closely connected with the sensibility of the eye. Differences of six or eight seconds will occur with different observers, and, Mr TAYLOR says, it is no difficult matter in Dr. MASKELYNE'S catalogues to discover when a new assistant came, from this circumstance.

Following the tables of the sun's diameter, we have a very full table of R. A. and N. P. D. of the sun, with the errors of the Tables computed for each observation, and from these the deduced obliquity of the ecliptic for 1st January 1831 is found

From observations near the summer solstice = 23° 27′ 40″·41.

From do. .. .. winter solstice = 23° 27′ 38″·98.

or after correcting Goldingham's latitude of the observatory, by — 0″·71,

The mean obliquity = 23° 27′ 39″·7 : in the Naut. Alm. it is 23° 27′ 42″·1.

But we have not space to enter into detail, and must confine ourselves to the heads of Mr. TAYLOR'S results.

A table of the deduced error of the equinoctial points follows : and then we have the A. R. and N. P. D. of the several planets, including the Georgium Sidus.

Towards the determination of the longitude, we have 84 comparisons of observed R. A. and N. P. D. of the moon, with her interpolated place from the Nautical Almanac; one lunar eclipse; and 21 eclipses of Jupiter's Satellites.

Mr. TAYLOR here also notices the different effects of irradiation upon different observers, which cause the semi-diameter of the moon to appear variable in its value, and necessitate an equal series of observations on both limbs to find the true passages of the moon's centre*.

No attempt is made to deduce the longitude from the lunar transits, because sufficient dependence cannot be placed on the lunar tables. The observations are however all compared with the interpolated place of the moon, from the Nautical Almanac, and the errors of the tables set forth: they vary from + 15 to — 17 seconds in time.

The mean of the 1st and 2nd Satellite observations gives the longitude from Greenwich, 5 hours, 21 minutes, 5.4 seconds, differing about a mile from Mr. GOLDINGHAM'S determination. Out of 51 observations of stars culminating with the moon,

* In a series of lunar transits observed at Benares, with an 18-inch instrument, there was always a difference between the observed and calculated times of the moon's diameter passing the meridian, of nearly a second in time.—*Orient. Mag.* vii. *p.* 32, *App.*

(uot *calumniating* her, as the Printer's devil has made it,) at Madras, five are provided with corresponding sights at the Greenwich observatory, and six with the same at the Cambridge observatory. From these the Madras longitude comes out 5 hours, 21 minutes, 3·7 seconds.

For the latitude we have 160 observations N. P. D. of selected stars with the mural circle *by direct vision*, and 171 *by reflection from a trough of mercury;* the extreme difference amounts to 6″, and the latitude deduced from the whole is 13° 4′ 9″·21 N.

The comet of January, 1831, was followed as accurately as the extreme faintness of the object would admit, from the 7th January to the 20th February: its position was as follows:

	h.	*m.*	*s.*		
Jan. 8. Comet's A. R.	17	29	27	N. P. D.	102° 34′ 10″
Feb. 20. —— do. ——	12	38	49.9		79 23 52.6

The last fifty pages (one third of the volume) are occupied by a valuable and important table of the places of the fixed stars, with reduction of the Madras catalogue to the 1st January, 1831, and the differences of each star in A.R. and N. P. D. from the Greenwich and the Astronomical Society's Catalogues.

"Of 423 comparisons of right ascension, between the Madras and Greenwich catalogues, there are 376 cases in which the difference does not amount to two-tenths of a second in time; of the remaining 46, there are 34 within three-tenths of a second; these have been carefully re-examined and found to be affected with a much less probable error than this amount; of the 12 cases which exceed seconds 0.3, three are confirmed by the Astron. Society's catalogue, and four only require further examination." This evidence speaks highly of the value of the Madras results, and they are not diminished by the larger proportion of discrepancies with the extended catalogue of the Astronomical Society, in which many stars have been brought forward from the less perfect tables of 1755 and 1800. "Out of 863 comparisons which this catalogue affords, there are 615 which do not exceed half a second; of the remainder many are confirmed by the Greenwich catalogue, or by subsequent observations at Madras in 1832."

In north polar distance the same accuracy prevails: out of 489 comparisons with Greenwich, 197 differ less than 1″·5; 122 less than 2″·5; and 115 less than 4″·0: and out of 1114 comparisons with the Astronomical Society's catalogue, 693 come within 4″; 315 between 4″ and 8″; and 105 exceed 8″.

In a few years, therefore, we may confidently expect the "Madras Catalogue of fixed Stars" to be appealed to as authority equivalent to that of either Greenwich or Berlin. In the name of every lover of the sublime science in this country, we would strongly recommend Mr. Taylor to publish annually, in advance (and we offer him our columns for the purpose), a short and authentic ephemeris of the principal celestial occurrences, to be attended to by astronomers in India, such as occultations of stars by the moon; Jupiter's Satellites; oppositions of the planets; transits and eclipses, &c. These should all be calculated for the meridian of Madras, to which as the nearest point of corresponding and nearly simultaneous observation, our observation should be referred. Meantime every Indian astronomer should provide himself with the volume before us, as containing besides the catalogues of stars, a variety of useful and practical formulæ for the correction and reduction of observations.

VIII.—*Meteorological Table kept at Bancoora, for the year* 1832, *by John MacRitchie, Esq.*

Months.	Lowest Ther.	Highest Ther.	Diurnal mean of the Bar. at noon.	Diurnal mean of the Bar. at 9 P. M.	Rain in 1832.	Rain in 1831.	Average of the 3 years.	Prevailing Winds.	Remarks.
January,....	62,8	70,0	29,80	29,79	,165	0	,55	N. W.	First two days cloudy, rest clear, sometimes variable airs.
February,...	67,9	74,5	,73	,66	1,275	3,000	1,425	W.S.W.	Mostly cloudy, heavy raining on the 16th.
March, ...	72,1	80,0	,69	,66	3,341	1,642	1,787	W.N.W	Variable weather and winds, heavy hail storm all round on 24, 25, and 26 ; stones said to weigh 1 chittack each.
April, ...	82,8	88,5	,64	,60	1,162	4,397	2,643	W.	Mostly strong southerly winds on surface, cloudy with strong heat at times, and heavy storms on the 24th and 30th.
May,.....	84,5	91,3	,53	,48	4,021	,340	3,329½	W.	Transit of Mercury over sun at 6 P. M. cloudy, strong South and Easterly winds till 21st, afterwards strong heat and winds, on the 11th heavy rain with strong gale, thunder and lightning.
June,.....	87,7	94,0	,35	,350	5,335	15,989	9,974½	W.	Rains set in, on the 24th cloudy, variable winds and hot before that date.
July,.....	84	88,6	,378	,370	12,225	10,987	12,904	E.	Very heavy showers with thunder and lightning during the month, but partial in the neighbourhood.
August,.....	83	87,0	,337	,347	16,571	11,286	11,588½	W.	Heavy rain with squalls, only 7 days without rain during this month—heavy thunder and lightning.
September,..	83	88,0	,508	,522	8,283	10,259	7,775	W.	12 fair days, heavy showers on most of the remainders, with thunder and lightning.
October,....	79	85,0	,640	,651	5,222	5,854	4,249½	N. W.	Severe gale for 6 hours on the 7th, with heavy rains, heaviest part of it passed to the eastward about 50 miles off.
November,..	72,3	78,9	,812	,791	,115	4,460	1,846	N. W.	Fine weather with sultry days, occasionally some specks.
December,..	64,5	70,	,745	,723	0	1,438	,479	N. W.	Ditto ditto Occultation of planet Venus with the Moon 25th, at 10 minutes after 8 P. M.
Averages,...	76,9	82,1	29,596	29,578	57,715	69,652	58,057	W.N.W.	

Fall of the Barometer, 7th Oct. 1832,.....0.480 inches.
Ditto,.... ..... 31st Oct. 1831,.....0.700 ditto.
Rain fell,.....7th Oct. 1832,.....3.895 ditto.
Do. do. .....31st Oct. and 1st Nov. 1831,..4.460 ditto.

Meteorological Register, kept at the Assay Office, Calcutta, for the month of July, 1833.

Day of the month.	Barometer reduced to 32° Farh.				Thermometer in the Air.				Depression of moist-bulb Thermometer.				Hair Hygrometer.		Rain.	Wind.			Weather.		
	At 4½ A.M.	At 10 A.M.	At 4 P.M.	At 10 P.M.	Minimum at 5 A.M.	At 10 A.M.	Max. by Reg. Ther.	At 4 P.M.	At 4½ A.M.	At 10 A.M.	At 4 P.M.	At 10 P.M.	At 10 A.M.	At 4 P.M.	Inches.	Morning.	Noon.	Evening.	Morning.	Noon.	Evening.
1	,500	,584	,480	,511	80,5	86,7	92,3	90,0	85,3	3,4	3,8	7,0	3,0	96	90	0,74	o.	s.	s. e.	haze.	clear.	c. cirri.
2	,451	,500	,428	,508	83,2	87,8	94,0	90,2	79,7	5,2	6,1	6,4	2,4	91	91		o.	s.	s.	scud.	do	rain.
3	,485	,555	,464	,533	81,4	86,2	90,2	88,3	81,8	2,3	4,5	3,8	6,1	94	98	0,25	s.	s.	s. w.	nimbi.	cum.	do
4	,488	,535	,487	,530	80,1	85,7	90,4	85,0	77,2	2,9	3,4	4,8	2,8	96	95	0,92	s.	s.	o.	do	fair.	do
5	,506	,526	,454	,539	78,5	83,4	90,4	87,5	84,0	2,4	4,2	4,4	3,2	98	95	0,56	N.	S.	o.	storm.	rain.	clear.
6	,478	,594	,432	,549	82,5	86,2	95,0	86,1	80,0	1,8	4,5	4,2	2,2	94	96		o.	o.	o.	cir. strat.	cum. cir.	do
7	,518	,609	,528	,567	79,5	85,4	91,6	87,2	83,0	2,5	4,2	5,0	4,6	94	93		s. e.	s. e.	o.	stratus.	showery.	do
8	,552	,534	,507	,539	81,0	86,5	92,4	90,5	82,5	2,0	5,1	7,2	4,3	93	90	0,15	o.	s. w.	s.	cir. strat.	fair.	do
9	,499	,504	,435	,514	82,2	88,2	96,7	91,3	85,8	3,1	5,7	8,6	5,6	92	84		s. e.	s.	S.	clear.	do	do
10	,470	,508	,435	,488	82,0	89,7	98,0	93,5	86,1	3,0	6,0	8,8	5,8	92	86		s.	s. e.	s. e.	do	do	do
11	,461	,508	,452	,516	83,1	89,7	98,0	90,4	85,0	2,7	6,8	6,0	4,0	92	93	0,52	o.	s.	s. e.	do	showers.	do
12	,476	,528	,435	,554	83,0	88,7	92,5	87,8	84,0	1,8	5,0	4,5	3,2	93	95	0,52	o.	e.	e.	nimbi.	thunder.	cum.
13	,450	,490	,417	,472	82,0	86,8	92,0	87,7	83,2	2,0	3,5	3,8	2,4	96	97	0,18	o.	s. e.	s. e.	do	overcast.	thunder.
14	,422	,493	,431	,483	78,1	86,1	87,4	87,2	83,8	0,1	3,7	3,5	3,8	97	98	0,34	s.	n.	s.	rain.	do	nimbi.
15	,439	,526	,467	,530	82,1	85,5	89,0	87,4	84,2	1,6	3,0	3,6	2,9	98	96	0,38	o.	o.	s.	nim.	cum.	overcast.
16	,482	,549	,470	,546	80,0	85,6	91,2	85,6	82,5	1,9	3,3	3,5	1,5	96	98		o.	s.	s. e.	cum.	do	rain.
17	,525	,574	,500	,548	78,4	85,4	90,0	87,8	84,1	0,2	3,3	4,5	3,4	96	94	2,10	o.	s.	s.	rain.	do	clear.
18	,515	,564	,472	,497	84,2	85,2	90,0	84,8	81,8	3,5	3,4	3,2	2,0	97	97		s.	s.	o.	overcast.	fair.	rain.
19	,479	,548	,479	,548	83,0	83,4	90,0	83,7	83,2	3,0	2,5	3,0	2,4	98,5	97	1,54	o.	s. w.	S.	cir. cum.	do	clear.
20	,497	,571	,494	,547	82,0	84,9	89,3	84,5	80,0	1,3	2,4	3,0	1,8	99	96		o.	s.	S.	cir. strat.	do	hard rain.
21	,503	,552	,475	,538	80,0	83,2	87,8	85,8	82,0	2,9	3,0	3,0	3,0	98	96	2,14	S.	S.	S.	rain.	do	clear.
22	,500	,558	,461	,519	80,2	83,0	91,6	87,5	82,7	2,0	2,8	3,7	3,0	98	96	0,10	n. e.	S.	s.	nimbi.	clear.	do
23	,529	,558	,487	,567	81,2	85,4	92,1	88,5	84,5	3,9	3,5	3,7	4,8	97	92		NE.	E.	E.	clear.	do	cum.
24	,502	,564	,458	,559	82,0	86,5	91,8	89,5	82,0	3,3	4,3	3,5	1,2	94	90	0,08	E.	s. e.	S. E.	cum.	do	clear.
25	,521	,571	,476	,540	80,0	86,8	92,3	87,8	83,1	1,8	4,0	4,0	3,1	95	94	0,60	s. e.	E.	E.	clear.	do	stratus.
26	,503	,546	,465	,523	81,0	86,4	91,8	88,5	84,3	1,6	4,5	4,4	3,3	94	95	0,06	E.	E.	E.	nimbi.	showers.	clear.
27	,489	,538	,446	,517	80,3	87,2	91,5	90,0	84,1	2,1	3,6	6,4	3,0	96	92	0,86	S.	s. e.	S.	rain.	clear.	scud.
28	,485	,525	,434	,483	82,2	87,7	93,2	88,8	85,7	1,2	4,5	4,2	2,2	94	95		o.	s. e.	S.	clear.	cum.	stratus.
29	,441	,460	,384	,463	83,2	88,3	93,8	87,4	84,2	2,2	4,5	4,5	2,4	95	95		o.	s. w.	s.	do	threatning	c. cum.
30	,415	,454	,376	,439	83,2	88,6	94,0	87,4	83,2	2,2	4,4	3,8	2,8	95	95		s. e.	N.	E.	stratus.	cloudy.	do
31	,419	,433	,419	,509	82,0	85,3	85,2	86,0	80,0	2,2	2,6	3,2	1,2	98	97		o.	N. E.	S. E.	haze.	hard rain.	all day.
Mean	,484	,533	,454	,522	81,3	86,3	91,8	87,9	83,0	2,3	4,0	4,6	3,2	95,4	94,0	12,44	calm and variable			moderate rainy.		

The Instruments for 10 A. M. and 4 P. M. are suspended in the free air of the laboratory, of which the windows are generally open. The Instruments for 5 A. M. and 3 P. M. are observed daily in the south veranda of a house near the Cathedral. The proper corrections for the several Instruments used will be furnished at the conclusion of the year.